Pit and Quarry

With which is consolidated CEMENT-MILL & QUARRY

Member Audit Bureau of Circulations

Read in Largest Number of Plants

Vol. XXII June 3, 1931 No. 5

Published bi-weekly on Wednesday for producers and manufacturers of Cement, Crushed Stone, Gypsum, Lime, Sand, Gravel and other non-metallic minerals. Entered as second-class matter October 9, 1928, at the Postoffice at Chicago, Ill., under the Act of March 3, 1879.

Copyright, 1931, by
COMPLETE SERVICE PUBLISHING CO.
538 South Clark St.
Chicago, Ill.

H. W. Baumgartner, *President*
V. E. Larsen, *Vice-President*
S. A. Phillips, *Directing Editor*
W. E. Trauffer, *Asst. Editor*
Harry F. Utley, *Asst. Editor*
Mat F. Beisber, *Asst. Editor*

Editorial Field Representatives:
A. C. Petersen
S. D. Smith

Advertising Representatives:
Chicago
W. A. Buschman L. C. Thaon
Telephone *Harrison 9357*
Chicago, Ill.

New York
E. M. Buck, 68-43 Clyde St.
Telephone *Boulevard 8-5259*
Forest Hills, L. I., N. Y.

Cleveland
W. E. Coates, 1258 Marlowe Ave.
Telephone *Lakewood 1166J*
Lakewood, Ohio

Subscription price: $5 for 3 years, $2 for 1 year in the United States and possessions, North, Central, and South America; elsewhere $1 additional for each year. Single copies 20 cents.

In This Issue

Editorials 27

Diesel-Powered Tug Hauls Bulk-Cement Barges on Mississippi River 30

The Design of Concrete for Workability, Permeability and Strength 36

Marble Chips for Use as Aggregate in Terrazzo Enjoy Popular Demand 43

Core Drilling Reveals Both Quality and Extent of Underground Deposits 45

Track System at Crushed-Stone Quarry in Tennessee Being Simplified 46

Birmingham Ready-Mixed Concrete Plant in Eighth Year of Operation 49

Keeping Iron Magazines Cool Will Avoid Deterioration of Explosives 53

Cold-Mixed-Asphalt Manufacture Offers Field for Aggregates Producers 55

Well-Designed Dredge Placed in Service by Indiana Gravel Producer 57

Financial Survey Points to Overbuilt Condition in Cement Industry 59

South American Plant Produces Gypsum at Average Cost of $2.43 per Ton 61

Men of the Industry 63
Coming Events 64
Pumpings from the Old Pit 64
Personal Mention 65
Latest Cement Statistics 66
Traffic News and Comment 68
Financial News 71
Review of Foreign Practice 72
Recent Patents 73
Manufacturers' Publications 74
Insurance Problems Discussed 75
New Machinery and Supplies 76
Legal Information 79
Correspondence 80

Next Issue June 17, 1931

Pit and Quarry

With which is consolidated CEMENT-MILL & QUARRY

Member Audit Bureau of Circulations

Read in Largest Number of Plants

Vol. XXII June 3, 1931 No. 5

Published bi-weekly on Wednesday for producers and manufacturers of Cement, Crushed Stone, Gypsum, Lime, Sand, Gravel and other non-metallic minerals. Entered as second-class matter October 9, 1928, at the Postoffice at Chicago, Ill., under the Act of March 3, 1879.

Copyright, 1931, by
COMPLETE SERVICE PUBLISHING CO.
538 South Clark St.
Chicago, Ill.

H. W. Baumgartner, *President*
V. E. Larsen, *Vice-President*
S. A. Phillips, *Directing Editor*
W. E. Trauffer, *Asst. Editor*
Harry F. Utley, *Asst. Editor*
Mat F. Beisber, *Asst. Editor*

Editorial Field Representatives:
A. C. Petersen
S. D. Smith

Advertising Representatives:
Chicago
W. A. Buschman L. C. Thaon
Telephone *Harrison 9357*
Chicago, Ill.

New York
E. M. Buck, 68-43 Clyde St.
Telephone *Boulevard 8-5259*
Forest Hills, L. I., N. Y.

Cleveland
W. E. Coates, 1258 Marlowe Ave.
Telephone *Lakewood 1166J*
Lakewood, Ohio

Subscription price: $5 for 3 years, $2 for 1 year in the United States and possessions, North, Central, and South America; elsewhere $1 additional for each year. Single copies 20 cents.

In This Issue

Editorials 27

Diesel-Powered Tug Hauls Bulk-Cement Barges on Mississippi River 30

The Design of Concrete for Workability, Permeability and Strength 36

Marble Chips for Use as Aggregate in Terrazzo Enjoy Popular Demand 43

Core Drilling Reveals Both Quality and Extent of Underground Deposits 45

Track System at Crushed-Stone Quarry in Tennessee Being Simplified 46

Birmingham Ready-Mixed Concrete Plant in Eighth Year of Operation 49

Keeping Iron Magazines Cool Will Avoid Deterioration of Explosives 53

Cold-Mixed-Asphalt Manufacture Offers Field for Aggregates Producers 55

Well-Designed Dredge Placed in Service by Indiana Gravel Producer 57

Financial Survey Points to Overbuilt Condition in Cement Industry 59

South American Plant Produces Gypsum at Average Cost of $2.43 per Ton 61

Men of the Industry 63
Coming Events 64
Pumpings from the Old Pit 64
Personal Mention 65
Latest Cement Statistics 66
Traffic News and Comment 68
Financial News 71
Review of Foreign Practice 72
Recent Patents 73
Manufacturers' Publications 74
Insurance Problems Discussed 75
New Machinery and Supplies 76
Legal Information 79
Correspondence 80

Next Issue June 17, 1931

Pit and Quarry

Member Audit Bureau of Circulations

With which is consolidated CEMENT-MILL & QUARRY

Read in Largest Number of Plants

Vol. XXII CHICAGO, JUNE 3, 1931 No. 5

Unveil Safety Trophy at Wampum, Pa., Plant

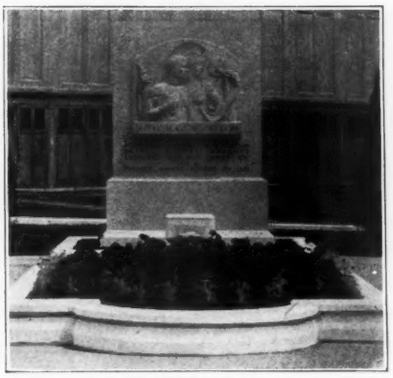
HAD NO ACCIDENTS IN 1930

The Portland Cement Assn. safety trophy awarded the Wampum, Pa., plant of the Medusa Portland Cement Co., was dedicated Friday, May 15, with appropriate ceremonies.

The exercises opened at two o'clock with W. L. White, Jr., assistant general manager of the Medusa company, in charge. A divine invocation was offered by Rev. J. Greer Bingham, pastor of the Wampum Presbyterian church, following which A. J. R. Curtis, assistant to the general manager of the Portland Cement Assn., made the formal presentation of the trophy to the men and management of the plant. As he concluded, little Clara Campbell, daughter of Lloyd Campbell of the electrical department, pulled a cord and the trophy stood revealed. As she did so, the crowd of a thousand or more broke into applause and cheers.

W. P. Rice, superintendent of the plant, accepted the trophy in a few words. He bespoke his appreciation for the coöperation of the men in the plant in the building of such a splendid safety record and promised that with a continuation of such coöperation the plant would go forward to an even better record.

J. B. John, president of the company, was introduced and congratulated the plant upon its efforts. Mr. John has been one of the leaders for safety in the cement industry for many years, and has served for many years as chairman of the safety committee of the Portland Cement Assn. Of the eight plants in the Medusa company, seven of them have won the association's safety trophy for a year's operation without a lost-time accident. In addition, the company was recently presented at York, Pa., the Joseph A. Holmes certificate of award for work in welfare and safety. This came from the U. S. Bureau of Mines and is a coveted award.



The Wampum safety trophy.

Among the officials of the Medusa Portland Cement Co. present were J. B. John, president; E. J. McGuire, vice-president and treasurer; W. L. White, Jr., assistant general manager; W. E. Wuerth, superintendent of the Dixon, Ill., plant; Phillip Mooney, assistant superintendent of the Dixon plant.

For the exercises, the workmen of the plant, some 150 in number, the school children, and the citizens of Wampum gathered in front of the grandstand. The trophy is erected in a small park which has been laid out for that purpose. It adds much to the beauty of the grounds, but its beauty is far outstripped by the humanitarian reasons for its presence on the grounds of the cement plant.

View of the crowd at the Wampum trophy dedication.

Highway Expenditures Exceed Early Figures

STATES WILL SPEND $961,621,000

Estimated expenditures for highway construction this year have been increased by $121,000,000, according to a check-up of the various state highway departments by the American Road Builders Assn.

Early this year the association announced that a canvass of all states revealed that $840,850,000 would be spent for roads. Recently, another survey was made, indicating that the total expenditures by states would be $961,621,000.

In only three states—Alabama, Iowa and Oklahoma—was the estimate lowered in the revised figures. The most notable increase was in Louisiana, where the state now reports it will spend $64,700,000 on its highways. Its earlier estimate was $30,000,000.

STATE	Original Estimate	Revised Estimate
Alabama	$15,900,000	$ 9,695,000
Arizona	6,500,000	7,950,000
Arkansas	15,000,000	18,000,000
California	30,000,000	34,000,000
Colorado	5,000,000	9,797,000
Connecticut	12,600,000	15,125,000
Delaware	2,200,000	2,410,000
Florida	12,000,000	12,000,000
Georgia	18,000,000	18,000,000
Idaho	5,500,000	6,540,000
Illinois	31,600,000	50,500,000
Indiana	24,000,000	24,000,000
Iowa	30,000,000	27,600,000
Kansas	13,700,000	14,300,000
Kentucky	20,000,000	25,000,000
Louisiana	30,000,000	64,700,000
Maine	13,100,000	15,115,000
Maryland	11,000,000	13,815,000
Massachusetts	20,000,000	25,000,000
Michigan	30,000,000	35,690,000
Minnesota	15,000,000	30,500,000
Mississippi	6,000,000	6,100,000
Missouri	33,500,000	41,354,000
Montana	4,500,000	7,000,000
Nebraska	10,000,000	13,000,000
Nevada	3,000,000	3,000,000
New Hampshire	5,500,000	5,500,000
New Jersey	36,000,000	40,500,000
New Mexico	5,650,000	5,650,000
New York	60,000,000	60,000,000
North Carolina	11,000,000	11,000,000
North Dakota	3,500,000	5,000,000
Ohio	34,000,000	34,000,000
Oklahoma	16,000,000	16,000,000
Oregon	10,000,000	10,500,000
Pennsylvania	60,000,000	60,000,000
Rhode Island	4,300,000	4,300,000
South Carolina	22,500,000	20,700,000
South Dakota	6,000,000	6,500,000
Tennessee	12,000,000	12,000,000
Texas	45,200,000	45,200,000
Utah	4,000,000	5,000,000
Vermont	5,100,000	5,100,000
Virginia	17,000,000	21,000,000
Washington	12,500,000	12,500,000
West Virginia	14,400,000	20,800,000
Wisconsin	33,000,000	25,000,000
Wyoming	5,000,000	5,180,000
Totals	$840,850,000	$961,621,000

Cement, Stone Heads at Chemical Exhibit

NEW EQUIPMENT ON DISPLAY

The thirteenth Exposition of Chemical Industries brought a wide variety of equipment and supplies to the Grand Central Palace in New York, N. Y., during the week of May 4-9. Three floors of the palace were filled with displays illustrating the developments which have been taking place in these industries.

The exposition held interest for almost every individual engaged in the industry. So closely is chemistry allied with every field that the exhibits represented a very thorough cross-section of all industry.

Many displays attracted the attention of cement manufacturers who attended the exposition. Equipment for grinding, pulverizing, filtering, proportioning and packing as well as almost every other phase of cement production was exhibited.

Of particular interest to limestone producers were the displays illustrative of the use of lime in the fertilizer industry. A portion of the exhibit of the U. S. Department of Agriculture was devoted to this subject.

Developments in rust-proof and non-corrosive steels attracted considerable attention.

As would be expected, there were many displays of laboratory equipment of all kinds. Electrical control and measuring devices were exhibited in great variety.

High-Grade Sand Found in Bed of River Raisin

The dredge operated by the Monroe Sand & Gravel Co. of Monroe, Mich., is now actively engaged in dredging sand from the River Raisin. The sand boat is operated under the direction of Clarence E. LaBeau. Material is being unloaded, washed, graded and stored at the company's shore plant.

The discovery of high grade sand in the River Raisin was made some time ago and Mr. LaBeau has been studying the possibilities for making use of it. It lies two feet under the river bottom and is covered by a heavy crust of silt and other accumulations.

Permission to dredge sand and gravel from the river was granted to Mr. LaBeau by Major D. McCoach, U. S. Army engineer in charge of the Detroit district.

Asbestos Bureau Formed in Northwest Territory

Asbestos firms of the Pacific Northwest have united in a program which requires certified insulations. This will preclude substandard insulation jobs, such as are occasionally being "put over" on the building owner when destructive competition prevails. Those constructing buildings will be urged to demand certified insulation—"C I" in the trade parlance—hereafter, the cost to be no greater.

Asbestos Bureau, Inc., with offices in Portland, Seattle and Tacoma, is the new organization through which the asbestos firms are united in this campaign.

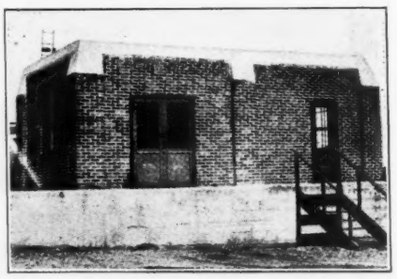
Builds Minnesota Plant to Fill Road Contracts

The LaGrange Stone Co., of Chicago, which recently obtained contracts to supply aggregates for a considerable mileage of pavement in Iowa, Minnesota and South Dakota this year, has leased a sand and gravel deposit at Luverne, Minn., and has started to construct a $40,000 sand-and-gravel plant on the property. A. J. Schneidermeyer of Sioux City, Ia., will be superintendent. More than 30 workmen will be employed to operate the plant, according to newspaper reports.

Oxygen Storage Building at Michigan Stone Plant

A recent addition to the crushed-stone plant of the Michigan Limestone & Chemical Co. at Rogers City, Mich., is the oxygen and acetylene storage building, pictured below.

The building is of brick construction on a concrete foundation and has a floor area of 365 sq. ft. A brick partition divides the building into two



New oxygen-acetylene storage building.

rooms, one for oxygen and the other for acetylene. Both rooms are provided with a ventilator in the roof and two ventilators at the floor line to provide a constant circulation of air. Ample space is provided for the storage of approximately 400 tanks of oxygen and 100 tanks of acetylene.

Due to its isolation from other buildings, the absence of electrical fixtures of any kind, the fire-proof construction, and proper ventilation, the building fulfills all the recommendations for the safe storage of oxygen and acetylene.

Completes Stripping at New Gravel Operations

The Clearwater Gravel Co. has completed the stripping of its new gravel pit near Bagley, Minn., and has installed washing and crushing machinery.

Gravel-Sales Concern Dissolves Business

PLANTS TO DO OWN SELLING

The Central Sand & Gravel Co., selling organization for eight of Portland, Ore., sand-and-gravel producers, was dissolved recently and discontinued business as of May 2.

The several companies which composed the Central Sand & Gravel Co. will each continue business under their separate identities. They are the Columbia Contract Co.; Hackett Digger Co.; Hawthorne Dock Co.; Nickum & Kelly Sand & Gravel Co.; Pacific Bridge Co.; Ross Island Sand & Gravel Co.; Star Sand Co., and James A. C. Tait Co.

H. P. Warren, who has been manager of the Central Sand & Gravel Co., is returning to the Portland Gravel Co., a producing company.

Sand-and-Gravel Selling Organization Dissolved

The R. J. Stewart Sand Co. was host to the Engineers' Club and the Board of Education of St. Joseph, Mo., at a luncheon and boat trip Thursday, May 7. The trip was made in the company's new tug-boat from its shore plant at St. Joseph to the dredge working a few miles upstream. During the trip the guests watched the entire process of dredging sand and gravel from the time it is taken from the bed of the river to the point it was loaded into the hoppers at the shore. Luncheon was served the visitors on board the boat.

Michigan Gravel Plant Installs New Scrubber

An Allswede scrubber was installed recently at the plant of the Cass City Sand & Gravel Co., Cass City, Mich.

Other general repairs have been completed and the company has started production for the season.

Urge Fencing of Gravel Pond After Boy Drowns

Following the recent drowning of a 13-year-old boy in the pond at the Queen Anne Sand Co. sand-and-gravel operations at Seattle, Wash., parents living in that vicinity appeared before a coroner's jury after the tragedy demanding that a high, woven-wire fence be erected around the entire property. W. C. Bickford, president of the company, was present at the hearing, opposing the plan because of the enormous expense it would involve.

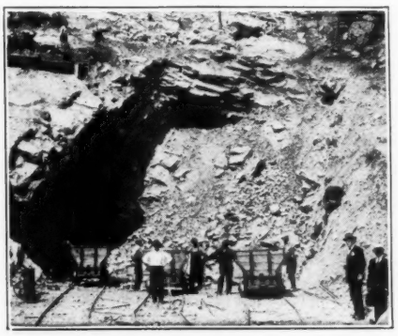
Nobody suggested, however, that Puget Sound, the streams, or the numerous natural lakes in the vicinity wherein unwary persons might drown if they became too venturesome, be similarly protected!

Virginia Silica-Sand Plant in Production

500 TONS PER DAY CAPACITY

The Virginia Glass Sand Co. recently put into operation a new silica-sand plant at Gore, Va. The plant was designed for the production of strictly No. 1 grade glass sand and has a capacity of 500 tons per day. The design, however, permits the installation of a second unit of crushing, washing and drying machinery, so that the capacity can be doubled at any time. All other equipment is capable of handling this increased capacity. All equipment except that otherwise accredited was furnished by the Lewistown Foundry & Machine Co.

The quarry is being worked into a hill-side near the plant, and a good



View in the silica quarry.

supply of water is also available. Rock is loaded by hand into cars which discharge into a receiving bin at the plant. This feeds the material to a Lewiston Foundry & Machine Co. 14-in. by 24-in. jaw crusher. The crushed material goes to a 9-ft. wet chaser mill.

Sizing is done on two rotary screens which discharge to two units of four 22-in. washers each. The washed sand is then discharged to a belt conveyor which carries it to the drainage building. A tunnel under this building allows the sand to feed through a number of openings onto the tunnel belt conveyor. This belt feeds to a 35-ft. rotary steam drier. The dried sand is elevated by a bucket elevator to two Hum-mer vibrating screens which discharge by gravity to a 300-ton-capacity storage bin. Shipments are being made over a siding 1-mile long from the Winchester & Wardensville Ry.

Iowa Highway Engineers Seek Gravel-Plant Site

A party of engineers of the Iowa State Highway Department has been looking over the territory around Traer, Ia., in search of gravel deposits for road material for highways to be constructed in that part of the state.

Dark Canyon Stone Co. Purchases Gravel Plant

The Dark Canyon Stone Co., Frank Lockhart, superintendent, recently purchased the C. P. Anderson sand plant which is located on the Cheyenne river near Creston, S. D.

The company will enlarge the plant soon and the Chicago, Milwaukee and St. Paul Railway company will build a spur track to the plant.

Lime Plant in Tennessee Anticipates Busy Season

The plant of the Eureka Lime Co. at Erin, Tenn., has resumed operations and will remain in production throughout the entire season, according to I. E. Everitt, president and manager. Wood-fired kilns are employed.

Opens New Gravel Plant Near Manchester, Mich.

The Merithew Gravel Co., Manchester, Mich., recently opened a gravel pit about 1½ miles west of Manchester. Geo. Roebuck, Norvell, Mich., is superintending operations.

Urges Highways Be at Least 20 Feet Wide

PLANS FOR FUTURE TRAFFIC

Road widening to a minimum of 20 feet is recommended in states and counties in a committee report of the American Road Builders' Assn., by C. E. Burleson, county highway engineer, Clearwater, Fla., chairman of the committee on road widening. Recommendations are also made as to when and how roads should be widened.

"The population in urban and suburban sections has grown so rapidly, and such a large percentage of the people own automobiles that the widening of old roads must be carried forward rapidly," declared Mr. Burleson.

Future traffic demands as to width of pavement should be anticipated for ten years, the committee says, and right of way should be wide enough for conditions 25 years hence. Highways for two lanes of traffic should be paved at least 20 feet wide with 6-foot shoulders for parking. Intersections should be widened to four traffic lanes (40 ft.) for 300 ft. in each direction from the corner. Where traffic exceeds 4,000 vehicles a 10-hour day, or frequent peak loads in excess of 800 vehicles an hour in one direction exists, a three or four lane road is needed. The salvage value of the old pavement should be sacrificed to improve the alignment or to provide clearer vision over hills.

In widening an old pavement, a narrow but substantial widening strip even with the old surface on both sides improves the appearance of the road, gives definite limits for pavement maintenance, and guides traffic. A few feet added to one side is less expensive than widening both sides, but the new track of vehicles may change the heavy loads to a weak point on the pavement.

The new silica-sand plant of the Virginia Glass Sand Co.

Three Sections Show Gain in Construction

APRIL TOTAL IS $336,925,200

A few bright spots on the building map are pointed out by F. W. Dodge Corp. in connection with the announcement of a general total of new construction contracts for April which is below that of April, 1930. Three of the thirteen Dodge territories comprising the thirty-seven states east of the Rockies showed gains in April construction totals over April, 1930.

Of the month's $336,925,200 total for all types of new construction, the upstate New York territory registered a gain with its $22,358,700 total; Central Northwest went ahead with $14,048,000; and the New Orleans district carried a gain over last year of $1,414,900 in its $7,791,900 total.

The April record of contracts awarded divided its total among the three major construction classes as follows: $95,896,400 in residential building; $108,035,600 in non-residential; and $132,993,200 in public works and utilities.

Residential building showed gains in the Metropolitan New York and Central Northwest districts. The Metropolitan New York total in this class was $34,873,900 as compared with $26,550,700 in April last year. The Central Northwest gain was slight with $2,061,500 in the month just ended as compared with $2,034,900 last year. Cumulative gains for the first four months of 1931 were shown in this class in these two territories.

Both Upstate New York and New Orleans territories produced larger totals in non-residential work and in engineering projects than in April, 1930. For non-residential building the New Orleans district was alone of the thirteen to show a gain over 1930 for the first four months of the year.

A gain over March of two per cent. in residential awards on a floor space basis contributes an optimistic note, although this gain is somewhat under the usual seasonal four per cent.

Missouri Business Men Form Crushed-Stone Co.

The St. Joseph Quarries Co. expects to open its new limestone quarry and crushing plant at the north edge of St. Joseph, Mo., as soon as the $70,000 worth of equipment can be put into readiness.

Thirty-five men will be employed at first and later a double shift will be used if the local demand is sufficient. The double crew is expected to turn out as much as 1,200 tons of rock daily.

Owners of the quarry are: E. H. Lawhon, president; George Groves, O. W. Watkins, Marion Land, A. L. Lehr, Charles A. Geiger, Harry Hesse, Henry Rix and W. E. Thompson, all St. Joseph business men.

Most of the aggregates used in the city are at present shipped in, and it is the purpose of this plant to furnish stone for local needs. It has been tested and meets the state and city requirements.

The plant is located near the Chicago Great Western R. R.

Oregon Portland-Cement Sales Exceed Capacity

The plant of the Oregon Portland Cement Co. at Baker, Ore., is busy on large shipments being sent for use on the Owyhee government irrigation project.

Fifty thousand barrels a month are being shipped to the project by drawing some from the reserve supply kept on hand. The plant's capacity is about 35,000 bbl. per month.

It is likely that the same plant will supply cement for the Baker dam and irrigation project when it is constructed.

Michigan Cement Plant Must Be Sold by 1934

The Michigan state legislature made a feeble gesture toward abandoning the Chelsea cement plant as a state property recently.

It passed the much-amended Look bill which provides that operations at the plant shall stop July 1, 1934, but, in the meantime, the plant will produce cement. Since there will be a legislative session again in 1933 the question may be renewed two years hence.

As originally introduced the measure proposed immediate disposition of the plant, but was amended before passage.

Darwin Meisnest, Cement Firm Executive, Resigns

In order to serve as executive vice-president of the Washington Athletic Club of Seattle, Darwin Meisnest, vice-president and director of the Pacific Coast Cement Co., has tendered his resignation with the cement firm. Mr. Meisnest has been in charge of the refinancing program of the athletic club for the last two months as its vice-president.

Bondholders of the club named Mr. Meisnest to take over active direction of the organization.

Columbia Brick Company Launches New Lime Unit

A new lime plant operated under the name of the Columbia Lime Manufacturing Co., a subsidiary of the Columbia Brick Manufacturing Co., of Columbia, Tenn., began operating in May. R. L. Vaughan, Jr., and Dixon Sowell are in charge of the plant, which is located near the brick works at Riverside, Tenn. Fifteen men are at work in the lime plant.

Cancel International First-Aid Team Meet

FINANCING IS UNSATISFACTORY

No national or international first-aid and mine-rescue contest will be held in 1931, it is announced by Scott Turner, Director of the U. S. Bureau of Mines. The decision to forego the contest this year was influenced by a number of considerations not the least of which is the fact that the method of financing these noteworthy gatherings has not been satisfactory. It is hoped that by next year provision may be made whereby in the future the Bureau of Mines can adequately finance such events.

Since the Bureau of Mines came into existence in 1910, one of its numerous functions has been the sponsoring of national or international first-aid and mine-rescue contests. These contests bring together about 50 first-aid and 15 mine-rescue teams from 15 or more states. In some years, teams from Mexico and Canada have also participated. The teams chosen are usually the winners of company, district, or state contests and the trip to the national or international meet is a reward for expertness in first-aid or mine-rescue work.

The contests have not been held annually because it seemed desirable to discontinue them during the war and, in 1922, as well as in 1924, the business depression caused postponement on account of the financial outlay involved in sending each participating team of five or six men considerable distances. In addition, the cost of the meet to the city in which it is held is approximately $5,000, as the Congress furnishes the Bureau of Mines no funds from which to pay for such essential expenditures as rent, printing of programs, and visits to adjacent mines and plants. Moreover, it is necessary to have the services of 75 to 100 experts in first-aid and mine-rescue work to act as judges; these men come from many parts of the United States, and here again the expense devolves upon the judges themselves or upon their employers, as the Federal government allows the Bureau no funds from which services of this kind can be paid.

New Keil Crushed-Stone Plant Starts Operating

The new crushed-stone plant operated by Gotlieb Keil at Hudson, N. Y., began production in May on a 50-tons-per-day basis. This capacity is to be increased to 200 tons daily later on in the season, according to Mr. Keil.

The new plant represents an investment of about $10,000 in equipment and is located on a 20-acre deposit on which little overburden is encountered. A storage bin has a capacity of 200 tons.

Editorials

Competition Without Restraints

EVER since the days of François Quesnay, but more especially since those of Adam Smith, the theory that free and unrestricted competition between individuals engaged in industry is conducive in the superlative degree to the well-being and happiness of society has been winning wider acceptance, both by economists who have specialized in the study of such matters and by the layman who has readily received these specialists' doctrines. This theory has stated in effect that the individual serves the community best when he is allowed to do what seems best to him, to choose his field of work, to fix the price of his services or product, and to sink or swim according to the vagaries of fortune. Its advocates have contended that, under such conditions, supplies, prices, profits, and wages would adjust themselves in a manner that was wholly natural and that would best serve the needs of all.

According to this "law of competition" there exists between these factors a definite and inescapable relationship as the result of which (1) an excess of demand above supply, or a shortage of supply, establishes a competitive situation between buyers and so raises prices, (2) the prevalence of higher prices results in larger profits, (3) the promise of greater rewards for invested capital attracts new money for the establishment of new enterprises, (4) the activity of these fresh factors in production increases the supply, (5) an excess of supply above demand, or a shortage of buyers, brings the sellers into competition and so reduces prices, (6) lower prices curtail profits, (7) reduced profits drive some of the producers out of business, and (8) reduced productivity reduces the supply below the demand and so reëstablishes the conditions assumed at the beginning. By the process of analogy the same theory was applied to wages, since labor came to be considered a commodity whose price was subject to the same conditions as the prices of other commodities.

What its proponents did not and do not realize is the fact that this theoretical law depends, for a demonstration of its principles, on the presence of ideal conditions under which there are no impediments to the exercise of a free competition. To make the theory workable it is necessary not only that there be no interference by government, but that all sellers should be easily accessible to all buyers and all buyers to all sellers, that there should be no obstacles to the operation of free competition. Unfortunately for the theorists such a condition of unrestricted competition has never existed and has never been even closely approached. The interposition of tariff barriers has widened the gulf between buyers and sellers at the same time that improvements in transport have narrowed it; the growing interdependence of individual communities, to the extent that each one has become less and less self-supporting, has made the theory less applicable to modern conditions than to those of earlier periods. Whatever practical workability it ever had has been greatly reduced by the increase in combinations or mergers, those natural results of unrestrained price-cutting and mutual destruction which have made the supervision of government, through such means as the Sherman and Clayton acts, seem necessary.

There is no incontrovertible evidence to show that the so-called "law of competition," even if it had validity, is now operative. The shortage of supply, that was supposed to create competition between buyers and so raise prices, has been seized by producers as an excuse for raising prices long before buyers have had an opportunity to compete with one another. Higher prices do not invariably result in higher profits, since higher commodity prices are soon followed by higher costs of production which tend to lower the profit rate. The entrance of new producers into a given industry often depresses prices long before the increased supply provided by their additional product makes itself felt, because many new enterprises make their initial bid for public favor through the medium of price concessions. The reduction of prices is, as every one knows, brought about more often by deliberate efforts to undersell a competitor and so ruin or embarrass him than by the operation of inter-producer competition arising from a desire to serve the consumer. Lower prices may, but do not necessarily always, bring reduced profits, neither do they result always in the extinction of so-called weak producers; weak industrial concerns have a marvelous capacity for holding on in spite of adverse conditions.

Free competition, even if it were the inescapable and unchangeable law that its advocates would make it, is not necessarily on that account a beneficent condition, either for the buyer or for the seller. The costs of production—and these, in an economic sense, must include the costs of competitive selling and business failure—are always borne by the consumer, so that the apparent gains of reduced prices are more than offset by the capital losses that result from destructive competition, since this competition entails an unnecessary amount of duplication of effort, of inefficient production, of wasteful buying and wasteful selling, the costs of which are paid ultimately by the consumer.

Under competition that is supposed to be free we find the needless expansion of industry as regards the number of producers and a resulting needless overproduction of supplies. The belief that every

boy is a potential president and every cobbler a potential shoe manufacturer—itself the product of the theory of free and unrestricted competition—is largely responsible for the frightful overdevelopment of all lines of industry with which we in America, more than those in other countries, are faced. It has stimulated men to greater efforts, it is true; and, but for it, some of our greatest industrialists would have remained in obscurity. Yet it has filled our professions, our trades and our industries with incompetents and misfits, it has added immeasurably to the cost of production and of living by forcing society to support, in conditions of misdirected and misapplied effort, perhaps the major part of our population and to pay the high cost of services poorly performed by those unfitted to perform them.

In seeking to insure the existence of conditions which economists of the old school held to be necessary to the preservation of free competition, Congress has given us the Sherman and Clayton laws, designed to safeguard the small business man from the rapacity of his larger competitor. Those who strove for the enactment of these acts were guilty of the paradox of demanding legal guarantees for the free exercise of a principle which they held to be an inviolable law, not realizing that, if free competition were a natural law, it would need no man-made props to insure its operation. Like most laws, these were enacted for the purpose of perpetuating conditions which seemed to be satisfactory and desirable in the past, without giving thought to the inevitably different and changing conditions of the future under which they would be applied. As the result, we find ourselves in the position of legally guaranteeing to every one the right to be industrially foolhardy without imposing on him any penalty for the ultimate damage which his foolhardiness is bound to cause. A man may not legally destroy himself physically because of the assumed value of his life to society, but he may with impunity destroy himself commercially although he at the same time injures others as well as himself.

It is the growing recognition of the absurdity of our so-called anti-trust legislation that has led prominent business men to advocate what Julius H. Barnes, chairman of the Board of Directors of the United States Chamber of Commerce, calls a "liberalization" of the anti-trust laws. Men are beginning to realize, first, that the preservation of a state of "free competition"—whatever that may be—is not the desirable thing it was thought to be and may be even dangerous, and, secondly, that, if government is to guarantee to every man the right to enter any business he chooses, at any time, at any place, and under any conditions, *ad libitum*, regardless of the state of that business with respect to overexpansion and oversupply and regardless of the resulting damage to those already engaged in it, government must also guarantee to existing business men protection from the ravages of the newcomer, if not by specific prescription, then by recognition of the right to conduct their businesses in a way that will insure their permanence. Government can not consistently protect the newcomer from damage by established business without protecting established business from the newcomer.

Even those entrusted with the enforcement of our anti-trust laws see the injustice of them and the damage that results from the inequalities they provide. Attorney General Mitchell, speaking over the radio recently, said that "possibly Congress might consider sympathetically some measure permitting combination to limit production of natural resources as an emergency to prevent waste, limited as to time, under government supervision, and to be followed by an early return to our present system of competition without restraints." Here we have another example of that strange mixture of common sense and absurdity which characterizes so much of what is said on the subject. When he advocates the legalization of combinations seeking to regulate production he shows an understanding of a possible remedy for overproduction, but when he recommends limiting such legalization to a certain period of time, he overlooks the fact that overproduction is always with us, that the consumer is forever paying the cost of overproduction, and that the "emergency" of which he speaks is merely the critical state in overproduction, a high point in a condition the dangers of which always exist but are merely emphasized by the present state of business. And when he refers to "our present system of competition without restraints" he shares the error of all "free-competition" economists and mentions a condition which does not exist. Even before the passage of our anti-trust laws "competition without restraints" was a figment of the imagination, and certainly since the enactment of that legislation, which prevents certain business men from practicing, on their part, methods which would be admissible under a state of competition really free, unrestrained competition is merely a phrase.

To soften the threat implied by his wish for "an early return to our present system of competition without restraints," Mr. Mitchell adds, "Because of business depression and unemployment, it is a delicate matter to take any action which may have a tendency to unsettle any business or delay business recovery, but the attorney general has no authority to refrain from enforcement of the anti-trust laws because business is not prosperous," and so on. Business may be grateful for Mr. Mitchell's thoughtful consideration, but it seems to us that not only during depressions is it "a delicate matter . . . to unsettle business." Is it not always, in an industrial country, a delicate matter to take action that is likely to render business unsettled and insecure? And may not a government, itself dependent on the condition of general business, find its own security-curve following closely that of general business?

According to Mr. Mitchell, the anti-trust laws were designed not only to protect the consumer, but to insure to the average individual freedom to engage in trade and commerce. "If we are to abandon these fundamental concepts," he said, "and permit combinations to limit competition, substituting gov-

ernmental regulation to protect the public against extortion and oppression, the change will have to be made by legislation." Which is a very natural and fair statement of the situation by one who is pledged to support existing legislation regardless of its suitability.

The remedy for many of our industrial ills lies in legislation, but not in the kind typified by the Sherman and Clayton acts. Existing laws seem to afford sufficient protection to the consuming public, but they make no provision for legalizing certain actions on the part of entire industries for the purpose of preventing overexpansion and overproduction. In this direction they should be amended so that means adopted, for example, to maintain prices not at a uniform level but at a profit-making level, to prevent the entrance of new enterprises into fields already overcrowded and suffering from the effects of overexpansion and overproduction, and for similar purposes that work no injustice to the consumer, now considered illegal under existing anti-trust legislation, would be made lawful.

Federal licensing of the production of natural resources might be an effective means of preventing the overdevelopment of certain industries, such as our own, beyond the need of the consuming public. Prospective producers of nonmetallic minerals, for example, might be required to show sufficient cause, on the basis of "public convenience and necessity," for the erection of a new cement plant or the opening of a new quarry, before being allowed to add to the clutter that already exists in a badly-overcrowded industry. Licensing might be extended to fix market areas and, thus, eliminate the practice of dumping which has worked such havoc in many industries. In these two ways, by restricting the number of newcomers entering a given field and by preventing the dumping of surplus production in markets already well supplied, government licensing might be of great help in reducing the wastefulness and destructiveness of what is called "unrestricted competition." Our public utilities, operating under laws which provide to a large extent the protection so badly needed in our industries, are conspicuous among the corporations which, in bad times and good, are able to show fairly consistent earnings and profits.

The prospect of government assistance in the control of production, or even that of regulation by the government, toward the end of safeguarding the capital already invested in industry, need cause no great alarm. Many trade associations seek by their own more or less ineffective means to accomplish the same result, but their failures are almost always due to their lack of power to enforce their decisions, to the very weakness which government assistance or government regulation would correct. They and those who support them should seek some workable method by which existing businesses can be made more secure and more profitable by eliminating the fear, the confusion, and the waste that result from the theory that industry is a free-for-all fight in which every one is free to engage, regardless of experience, training, ability, or the need for his service. Government, through its police power, may offer a practical, though unpalatable, remedy.

The fact is that we do not have the "free and unrestricted competition" which the economists would like to wish on us, and, if we could see all its inevitable consequences, we would not want it. Business is operating under legal conditions which restrict its sensible development and prevent the protection of its invested capital while they encourage the establishment of new and unnecessary enterprises that provide additional competition and add to the difficulties and costs of carrying on existing businesses. And, if these conditions are not improved, the uncertainty of business may be expected to increase with every increase in population and trade volume. Either trade associations or the government acting separately, or the two acting in concert, can give business much-needed relief, but the necessary methods must be legalized by the passage of suitable legislation.

A.R.B.A. Studies Keep Pace with New Road-Building Problems

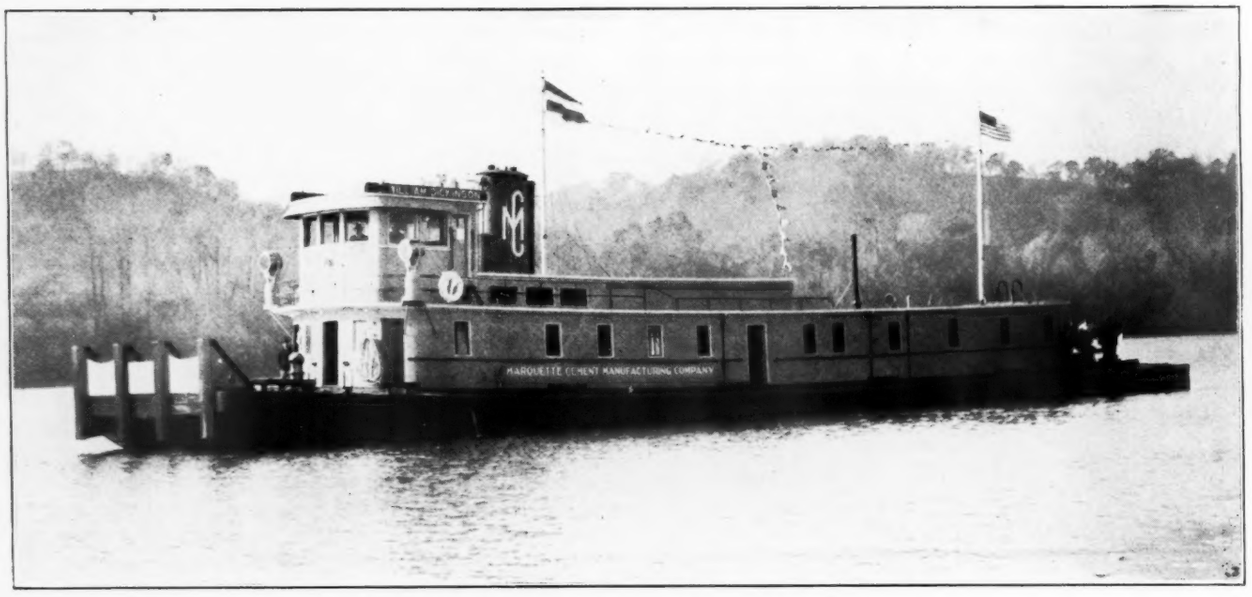
In the three decades the American Road Builders' Assn., has been engaged in acquiring and distributing information about highway finance, construction, maintenance and use, a tremendous development in roads and streets has taken place. The work of the Association has grown to keep pace with this development.

With the increased popular demand for smooth, wide and strong highways there have come new problems of finance, design and construction, the tremendous increase in passenger and freight traffic on the roads, and the use of machines and improved materials for nearly every phase of road work.

The strong impetus given to road building by the demands of an ever increasing traffic, and the change in the character of that traffic, is reflected in the larger appropriations for road work, increased employment for road builders, and greater business for manufacturers of equipment and materials. It is the work of the association to represent all of these interests.

To stimulate interest in road building the association is engaged in the promotion of road programs to improve the facilities for travel, decrease congestion, and assure the public of adequate roads and streets.

The scientific or research activities of the association are widespread. Unfettered by restrictions, the staff engineers work continuously under the direction of committees of leading state, county and city officials, contractors, and manufacturers to standardize road and street practice and to discover new facts. Information as to methods and materials is analyzed impartially and the facts found and the conclusions drawn are presented at the annual convention and in the proceedings and bulletins which have wide circulation.



The new tug as it appeared on the river shortly after launching.

Diesel-Powered Tug Hauls Bulk-Cement Barges on Mississippi River

Twin-Screw Vessel of 700-Hp. Placed in Towing Service by Marquette Cement Co.

By T. R. TARN
Naval Architect, Pittsburgh, Pa.

THE Diesel, twin-screw river tug *William Dickinson,* built for the Marquette Cement Mfg. Co., Chicago, Ill., by the Marietta Mfg. Co., Point Pleasant, W. Va., from designs prepared by the writer, has the following principal dimensions:

Length on deck	124 ft. 0 in.
Beam molded	26 ft. 0 in.
Depth molded	7 ft. 0 in.
Crown of deck	.6 in.
Mean draft, service condition	5 ft. 0 in.

The tug was specially designed for towing bulk-cement barges on the Mississippi River and is operating from the Cape Girardeau plant of her owners to St. Louis and Memphis, where extensive river terminals have been built. The construction of the tug includes the most modern equipment available, with special provision for the comfort of the operating personnel.

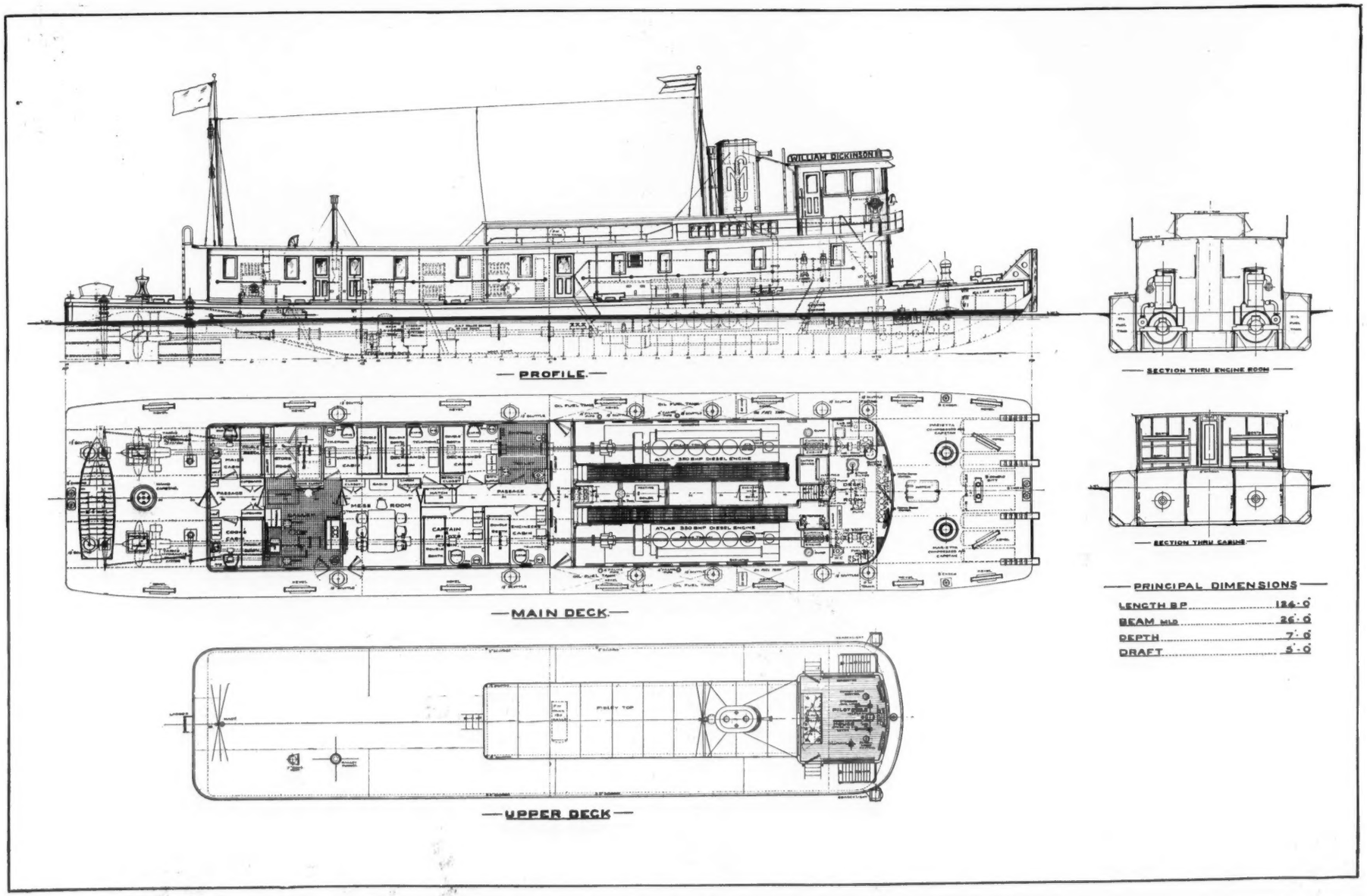
The hull is of the open-tunnel type, constructed of steel material, having a modified-scow bow and square-transom stern, and is framed transversely with rounded bilges. The deck is faired forward and aft and terminates in rounded corners at the transoms. At the forward transom, knees are fitted for towing on the head.

The under-water portion of the stern is arranged to facilitate the easy entrance of water to the propellers and for easy discharge therefrom in order to obtain greater effectiveness from the propellers, greater ability to steer and handle, and to simplify the hull construction and the attachment of the stern bearings, struts and rudder bearings.

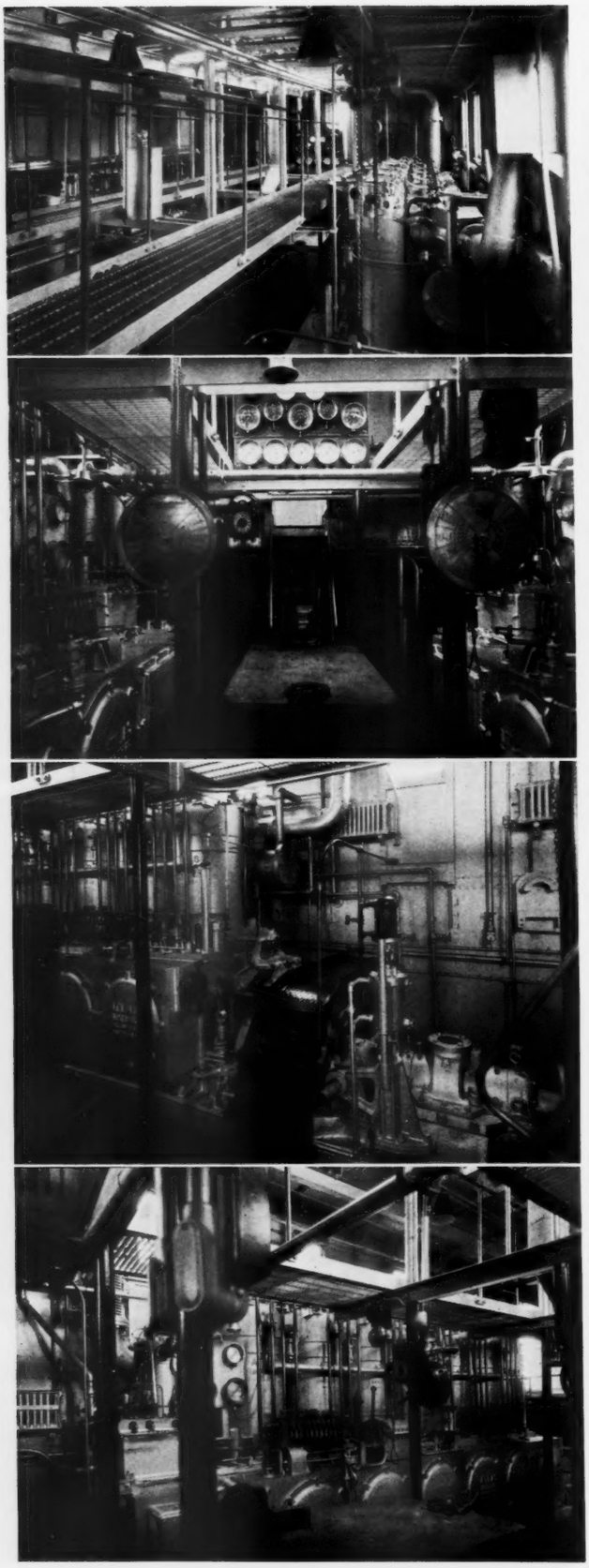
Unlike the usual curved and rounded tunnels built into craft of this type, the tunnels are flat-topped and straight-sided more definitely to direct and deliver a solid column of water to the propellers. This construction improves the effectiveness of the propellers due to the elimination of the revolving or swirling action imparted to the water which takes place in the case of rounded tunnels in the way of the propellers.

A fuel capacity of 40 tons has been provided in the "wing tanks" abreast the engine space in three fore-and-aft tanks, port and starboard. The fore-peak provides ample space for the special Marietta duplex air engines for the deck capstans, air-storage tanks for the main and auxiliary Diesel engines, the Lux fire-prevention system, and stowage of deck tackle.

The after-hull compartments contain the hydro-pneumatic twin steering-gears, with the pumps and tanks associated with the independent steering and handling system, as well as compartments for the stowage of the engineer's supplies, "spares," and galley stores. The steering and handling system provides for operating the starboard rudders or the



The Diesel tug "William Dickinson," owned and operated by the Marquette Cement Manufacturing Co.



Four general views of the engine room of the new towboat William Dickinson. The two 350-hp., 225 r.p.m. Diesel engines are capable of developing 480-hp. at 260 r.p.m., should navigational difficulties make it necessary. The engine room of the big Diesel-powered craft is a modern marvel of efficiency.

port rudders independently of each other, to conform to the direction of rotation of each associated propeller.

The main deck-house is of steel and houses the deck room forward, the engine room and the crew's quarters aft of the engine room. The portion of the deck-house containing the crew's quarters is ceiled with Celotex insulation and panelled. The skylight-ventilator over that portion of the deck-house in the way of the engine room is portable.

The pilot-house is of steel and ceiled with beaded yellow pine, finished bright. The usual pilot wheel for the manual operation of the rudders is not included as part of the pilot-house equipment. Instead, steering-lever controls synchronized with the helm angles are used, with less space and complication.

The exhaust stack is of steel, 6 ft. long by 4 ft. wide and houses the Maxim silencers for the main and auxiliary engines. The sides of the stack are portable for gaining access to the silencers.

The deck equipment consists of two combination manually- or power-operated capstans on the forecastle, a manually-operated capstan on the after deck, and the usual outfit of cast-steel bitts, chocks and cavels. In contrast with the usual "low-down," elliptical-shaped cavel with its flat top and bottom and small radii of sides which has survived since wooden-steamboat days, the barrels of the cavels are of uniform diameter throughout to give less wear with greater contacting surface to the tow lines and with less likelihood of rupturing the rope strands. The chocks are also a departure from the conventional type in that they are entirely pin-bearing and each may be used for pulls from either a forward or from an astern direction, thereby eliminating the usual installation of double-chocks to answer the same purpose.

On the after deck, seatings are provided for cranes to serve the trunk hatches over the propellers. A single portable crane is provided to serve these hatches and is stowed below deck when not in use.

All fuel and water hull tanks, deck-doublers and fittings, and weather decks are electrically-welded in addition to being riveted.

The main propelling machinery consists of two 6-cylinder, vertical, 4-cycle, solid-injection, directly-reversible, full Diesel engines manufactured by the Atlas-Imperial Diesel Engine Co., of Oakland, Cal.

The engine cylinders are 14 in. in diameter and have an 18-in. stroke. They develop 350 hp. each at 225 r.p.m. and are capable of a greater sustained horsepower should navigational difficulties require.

Each engine is fully equipped with all the units necessary for its operation built-in. The units on each engine are cross-connected with each other and with similar auxiliary units. Mounted on a continuation of the engine bed-plates are Kingsbury thrust bearings and sailing clutches. The latter are operated by means of compressed-air jacks from the control station. Each clutch is adjusted to a point just beyond the maximum power requirement and thereby becomes a "slip" or "loose coupling" between the engines and the propellers.

The propelling engines are operated and controlled by means of a novel single-lever hydro-pneumatic control originated by the engine builders. The control lever has a straight-line action and, in addition to regulating the engine speeds and reversing, actuates the braking mechanism engaging the flywheel.

The propellers are 4-bladed solid wheels, of semi-steel, furnished by Ferguson & Son. They are 6 ft. in diameter with a pitch of 63 in. and turn inboard at the top when operating in an ahead direction. Two extra propellers, one right and one left, are carried as "spares."

The stern-bearing tube-and-strut assembly is extra heavy to withstand hard service. The tubes are flooded with oil from a gravity-pressure system. Tail shafts are 8½ in. in diameter and the line shafting 8 in. in diameter. The intermediate bearings are of the SKF type.

The rudders are made of cast iron. They are secured to the nickel-steel rudder stocks by means of flanged heads. Breaking necks are provided under the flanged heads of the rudders, to allow their sinking out of harm's way in the event of striking obstructions, and thereby preclude the possibility of damage to the hull and propellers. Two extra rudders, one steering type and one flanking type, are included as spare gear. For convenience in making replacements of rudders and propellers, the underwater parts have been accurately machined to plug-and-sleeve gages which were provided as part of the vessel's equipment.

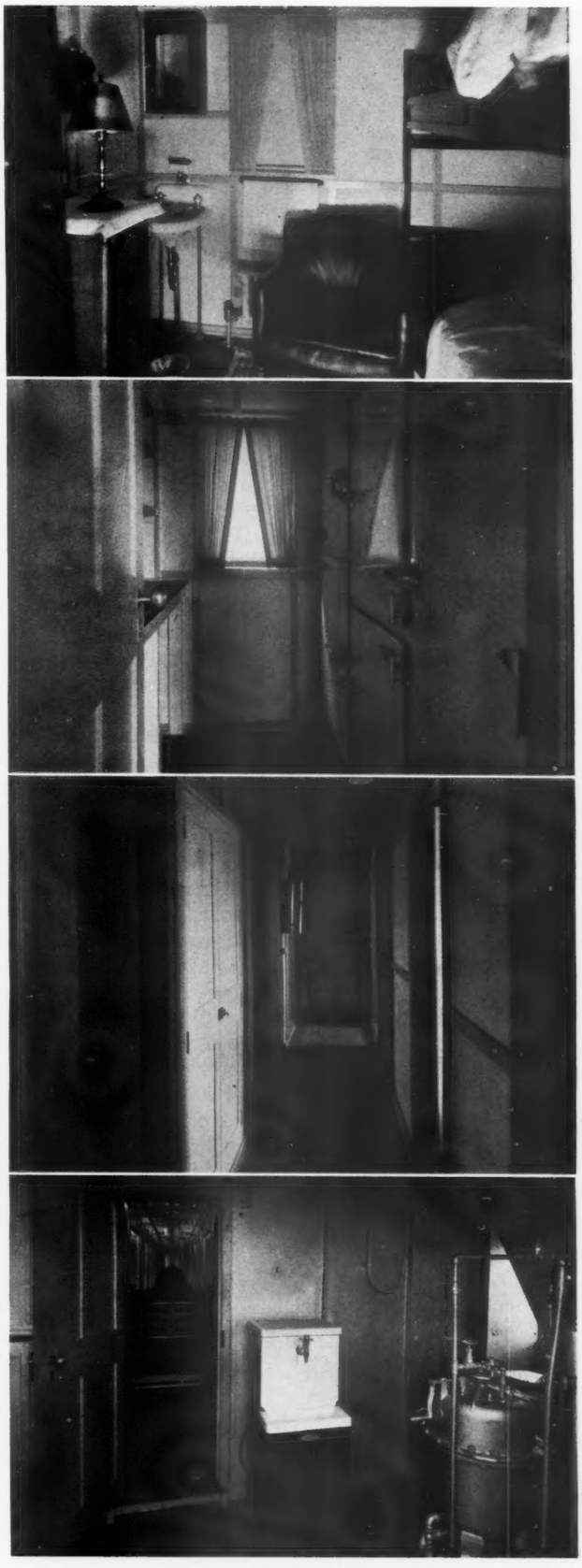
The electrical generating equipment consists of two, 3-cylinder, Model U, 4½-in. by 6-in. direct-driven, 12½ kw. generator-compressor sets, self-contained on a common bed-plate. The air-compressors are Ingersoll-Rand, Type 20, 5-in. by 2¼-in. by 4-in. in size, driven through friction clutches from the engine-generator shafts.

Two 19-in. brass-case Carlisle & Finch Co. searchlights, fitted with Bausch & Lomb mirrors electrically-controlled from the pilot-house, are installed on the forward upper deck. Special, floor-mounted, push-button controls, as manufactured by the General Electric Co. in connection with relay switches and contactors, control the current-supply.

A complete, inter-communicating telephone system, as manufactured by the S. H. Couch Telephone Co., provides communication throughout the vessel.

Radio receiving apparatus, built by C. R. Leutz, Inc., is installed in the mess room, engine room and pilot-house. In addition to providing entertainment for the crew, this apparatus provides information broadcast from radio station WLW at Cincinnati, O., regarding the river stages and the weather.

The steering-gear pressure pumps and fire and bilge pump are Goulds Mfg. Co. triplex plunger pumps, driven through Morse silent chains. The fuel-oil transfer and lubricating-oil pumps are of Viking Mfg. Co. make, motor-driven, through gears. The fuel and lubricating-oil purifiers were made by the DeLaval Separator Co. The raw-water and filtered-water service pumps are motor-driven and automatically-controlled.



Reading down—View of officers' quarters on board the Dickinson. Looking into the pantry, just off the galley—Passageway in crew's quarters. Deckroom on the new towboat. Fresh-water filter in foreground, stone filter at right and doorway into engine room.

Looking up under the stern tunnel at the two screw propellors and the three rudders.

Interior of the pilot house showing the modern lever-steering apparatus.

The water filtration system consists of a Bowen quartz filter, with coagulator and a Lynn stone filter as manufactured by the Hygeia Filter Co. Filtered-water storage is provided in hull tanks and by means of a pneumatic-gravity supply. A chlorination system of treatment, as manufactured by the Wallace & Tiernan Co., is installed in connection with twin service pumps through meters made by the Neptune Meter Co.

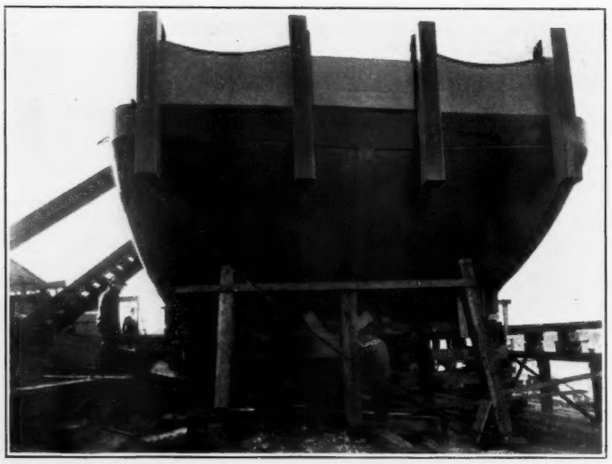
The steam-heating boiler is a No. 1-S-9 Ideal, as manufactured by the American Radiator Co. and is provided with a full automatic Heat King fuel oil burner as manufactured by the Automatic Burner Corp. Radiation is provided in each room through the crew's quarters, engine room, deck room and forepeak. Valves on the radiation are of the Crane Co. packless type and the outlets are equipped with Sylphon traps as manufactured by the Warren Webster Co.

All plumbing fixtures were furnished by the Standard Mfg. Co. Lavatories are provided in each stateroom. In the crew's wash room the floor is laid with non-slip ceramic tile and the walls with porcelain metal tile on Nu-Wood grooved foundation sheets made by the Pittsburgh Porcelain Tile Co. The galley floor and walls are treated in the same manner, both in colors corresponding to the owner's trade containers.

The refrigerating apparatus consists of a white porcelain steel Seeger Refrigerator Co. refrigerator, having a capacity of 80 cu. ft. and a Frigidaire refrigerating unit. Drinking water is supplied by a self-contained Frigidaire unit.

The galley range was made by the Ingle Mfg. Co. and is equipped with a Valjean fuel-oil burner. The hot-water supply is provided by a water-back located in the galley range with the usual pressure-storage boiler.

The steel deck in the way of the crew's quarters is covered with battleship linoleum laid over Nu-Wood insulating foundation sheets. Both the sheets and the linoleum are laid with waterproof cement.



Workmen at the stern of the vessel on the ways at the yard.

The air siren is of the Tyfon type made by Nils F. Nord. The engine telegraphs were made by Cory & Co. and the bells and ventilators by W. & J. Tiebout. The 18-ft. yawl, built by the Racine Boat Works, is equipped with a 16-hp., Model 45, Johnson outboard engine.

The crew's quarters throughout are provided with Westinghouse marine-type fans. The berths

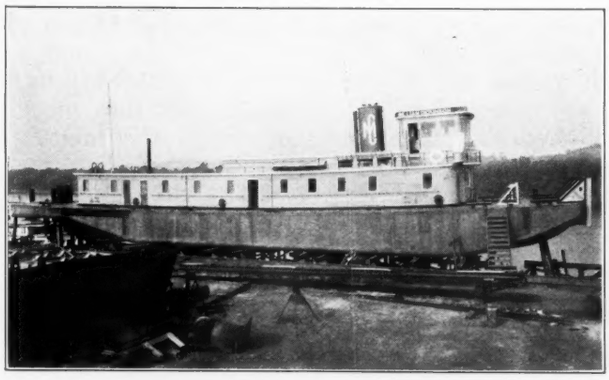
Two of the fleet of modern steel cement barges of the Marquette company, for use on Mississippi River between Cape Girardeau and Memphis.

are special, walnut-finish, using tubing made by the Rome Co. and are fitted with coil springs. The air-cushion mattresses were furnished by Magad Bros. and the bedding and linen by Carson Pirie Scott & Co. The curtains and hangings were furnished by the Joseph Horne Co. and the floor coverings and lockers by Marshall Field & Co.

The engine indicators were supplied by the Bacharach Industrial Instrument Co. and the speed and temperature instruments by the Foxboro Gauge Co. The ship clocks and barometers were supplied by the Waterbury Clock Co.

All standard and special air and water valves and the bilge manifolds were furnished by the Crane Co. All oil and bilge piping is of copper.

The tug was constructed under the supervision of



The tow-boat on the ways shortly before launching.

the American Bureau of Shipping and classified for the highest rating for river service.

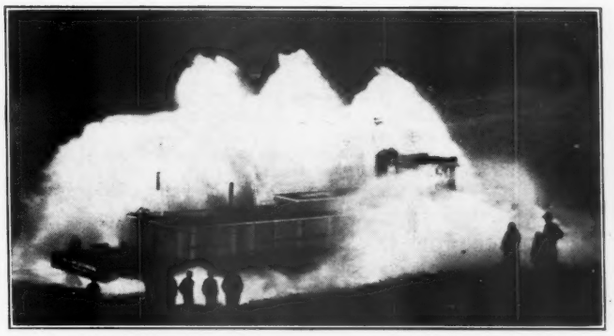
During the latter part of 1929 the Marquette Cement Mfg. Co. placed four self-unloading bulk-cement barges in service for the transportation of cement by water. Each of these barges has a capacity of 5,000 bbl. and is equipped with Fuller-Kinyon pumps for discharging the cement into storage silos located at Memphis and St. Louis.

The barges are of steel construction with three longitudinal hoppers, each 144 ft. long. Each of the hoppers is served by a screw conveyor, into which the cement flows by gravity through manually-operated control gates. At a point amidship the longitudinal conveyors discharge into a thwartship conveyor which in turn discharges into the hopper of a Fuller-Kinyon cement pump.

In loading the cement into the silos ashore, the cement pumps aerate the cement and discharge it, by means of an electrically-operated screw, which feeds the cement into the air-mixing lines for discharge ashore and for blowing out the lines when the equipment is shut down. The necessary air and electrical current for the operation of the equipment aboard the barges are received from ashore.

The dimensions of the barges are 175 ft. by 35 ft. by 7 ft. The cement bins or hoppers extend 4 ft. above the main deck and are covered with light plating made weathertight by welding.

In undertaking the movement of bulk cement on the Mississippi River the Marquette company is the first manufacturer to do so. Since the inauguration of the service the storage capacity at both terminals has been doubled and plans for the extension of the service are ready for approval.



The vessel taking the water at the shipyards.

The towboat *William Dickinson* is named in memory of William Dickinson, pioneer importer of Portland cement and past vice-president of the Marquette Cement Mfg. Co.

Fluorspar Production Shows Marked Decrease in 1930

The fluorspar industry was adversely affected by the general decrease in operations during 1930 in the industries in which this mineral is used, and as a consequence the domestic fluorspar producers' volume of business was the smallest since 1921, according to a statement by Hubert W. Davis, U. S. Bureau of Mines. Of interest are the substantial decrease in domestic shipments; the pronounced increase in imports from Germany and France; the increase, effective June 18, from $5 to $7.50 a short ton in the rate of duty on fluorspar containing 93 to 97 per cent. of calcium fluoride; the large stocks of fluorspar at consumers' plants on December 31, especially the stocks of 89,000 short tons that have been accumulated at basic open-hearth steel plants; and the accomplishment of the first river-rail shipments of fluorspar to the Pittsburgh district.

Shipments of fluorspar from mines in the United States in 1930, amounting to 95,849 short tons, consisted of 85,094 tons of gravel fluorspar, 4,281 tons of lump fluorspar, and 6,474 tons of ground fluorspar. The general average value for all grades per ton f.o.b. mine shipping points was $18.22, 84 cents less than the 1929 average. The general average value of the fluorspar shipped to steel plants in 1930 from the Illinois-Kentucky district was $16.99 a ton, as compared with $17.36 a ton in 1929. Fluorspar was shipped from Colorado, Illinois, Kentucky, Nevada, and New Mexico in 1930, of which only Colorado recorded an increase.

There was a decrease in shipments of fluorspar in 1930 to each of the industries, except the cement industry, in which the mineral is used. Domestic producers shipped 35 per cent. less fluorspar to steel plants and 37 per cent. less fluorspar to foundries in 1930 than in 1929. In the ceramic industries the shipments of fluorspar to manufacturers of glass and enamel decreased 45 and 44 per cent., respectively, but the shipments to cement plants were a little more in 1930 than in 1929.

The Design of Concrete for Workability, Permeability and Strength*

By A. T. GOLDBECK

Director, Bureau of Engineering, National Crushed Stone Assn.

IN approaching this subject I have tried to place myself in the position of the average ready-mixed concrete producer, and I have asked myself what information I should like to have on the proportioning of concrete if I were in the ready-mixed concrete business. There are a great many theories on the proportioning of concrete, some of them of a more or less complex nature and all of them more or less inter-related. It is not at all my purpose to discuss these theories, but rather to give you a practical working basis upon which the proportions of concrete mixtures, suitable for the purpose in hand, may readily be obtained. It is useless to make a complicated matter out of a really simple procedure, and I know that you are interested in obtaining the most suitable proportions of concrete in the simplest possible manner.

Before discussing the proportioning of concrete or the effect of proportions on the strength, durability and impermeability, let us get clearly in mind some of the basic facts regarding the composition of concrete. Concrete consists essentially of a mixture of cement paste and aggregate. The cement paste is the binding medium which glues the aggregate together into a solid mass. The properties of the final mixture are affected by a number of different factors, the principal one of which is the amount of water used in mixing the ingredients together. The cementing properties of the cement paste are greatly affected by the amount of mixing water used. It is now well-established that the greater the quantity of water employed, the weaker is the resulting cement paste and, consequently, the weaker the concrete produced.

The ready-mixed concrete producer may be called upon to produce concrete complying with two different types of specifications, one of which calls for certain fixed arbitrary proportions, such as 1:2:4, and the other requiring the production of concrete having certain desired properties, such as a given crushing strength at the end of 28 days, or a given transverse strength and a given workability. We are here concerned, primarily, with concrete produced under the second type of specification, in which the producer may exercise his ingenuity to produce the most economical concrete satisfying the requirements.

The fundamental conception of concrete, however, remains the same, no matter what type of specification is in force. Concrete must be supplied for all types of construction which require concretes having different degrees of workability, different strengths and other characteristics. One of the first items, therefore, which confronts the ready-mixed concrete producer in proportioning concrete for a given purpose is the fact that he must turn out concrete which is suitable for the purpose from the standpoint of consistency or workability and that he must so contrive the relative proportions of water, cement, and fine and coarse aggregate that the required strength will be secured with the utmost economy. Were it not for this factor of workability and the necessity of producing a plastic mass, it might be possible to use only enough water in the mixture to hydrate the cement and no more. But, as a matter of fact, with our present methods of mixing and placing concrete, it is always necessary to use more mixing water than just enough to hydrate the cement; otherwise the mixtures would be far too dry for proper workability.

One might conceive of the final mixture of concrete, therefore, as a mixture of coarse and fine aggregate with cement which has combined with a certain proportion of the mixing water. In addition, however, there is a certain amount of water which does not combine with the cement but which remains in the mass as "free water." This free, or uncombined water occupies space in the mass and, if it later evaporates, it leaves void spaces. The greater the amount of free water present, the greater will be the voids and the more porous will be the concrete. In general, the higher the water-cement ratio, that is, the ratio of the volume of water to the volume of cement in the mixture, the greater will be the amount of free water present in

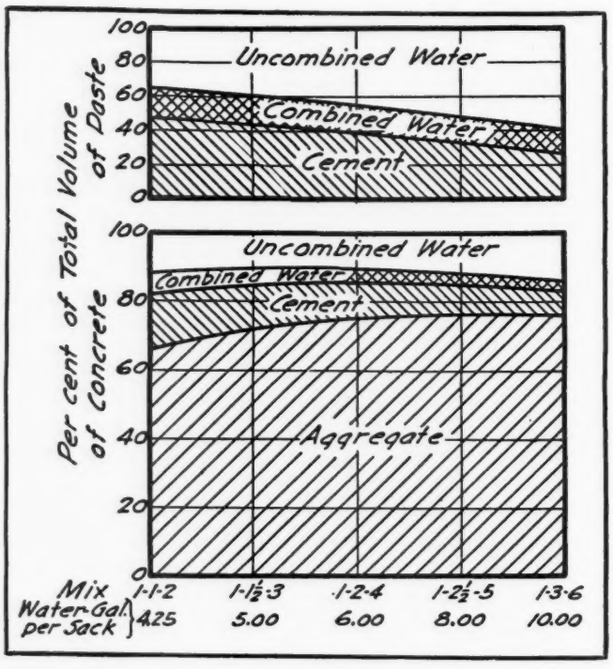


Fig. 1. Analysis of concrete mixtures of uniform consistency.

* From an address delivered at National Ready Mixed Concrete Assn. annual meeting, Jan 26, 1931, St. Louis, Mo.

the concrete, and consequently the more porous will that concrete be. It must be self-evident that high porosity in concrete must make for high absorption and generally a high degree of permeability and, because of the high absorption, the action of frost on porous concrete is apt to be unusually severe. Such concretes are, therefore, likely to be non-durable. It is quite evident that the water-cement ratio, no matter how it may be expressed, whether in terms of cubic feet of water per sack of cement or in gallons of water per sack of cement, is a primary consideration in the proportioning of concrete.

Let us get clearly in mind this fundamental conception of concrete. We mix together a lot of materials of coarse and fine aggregates and cement and water. Of course, the absolute volume of concrete produced is made up of the sums of the solid portions of each ingredient; we are concerned only with the solid portions of these specific materials.

Prof. F. R. McMillan, research director of the Portland Cement Assn., in his book entitled "The Basic Principles of Concrete Making" gives a fine illustration of the proportions of aggregate, cement, combined water, and uncombined water in concretes of various proportions. His Fig. 1 is reproduced herewith. It will be noted that the uncombined water in mixtures having a slump of three to four inches may be from 60 to 80 per cent of the total water added to the mixture. This diagram also brings out very forcibly the well-known fact that, for a given consistency, lean mixtures require a higher water-ratio than rich mixtures of concrete.

I think a diagram of this sort is one of the most useful that can be drawn to explain the properties of different kinds of concretes. The uncombined water is a very important factor in controlling the porosity, the permeability, and the resistance of concrete to weather.

Of course, the higher the percentage of uncombined water the less durable and permeable and the more porous that concrete is going to be. The ideal would be to mix concrete so that the uncombined water portion would be kept to a minimum.

Concrete as mixed in the old days was far from workable; but it was put in place by hand labor, and the water was drawn from each block, and that concrete was exceedingly durable. The reason is evident when you see a diagram of this sort. There was very little water that was combined with the concrete and, as that concrete was put in place, there was little porous space left and naturally there was no absorption. Such concrete, packed into place, would be highly resistable to weather, because water could not get in later and freeze.

It seems almost trite to even mention the relation of compressive strength of concrete and the water-cement ratio used in the concrete mixture. This subject has been fully covered by technical concrete literature of recent years, particularly that emanating from the laboratory of the Portland Cement Assn., where this relation was originally established under the guidance of D. A. Abrams.

Prof. Abrams showed that, so long as the mixtures were plastic and further, as long as other conditions, including materials, character of curing, and temperature of curing were identical, the compressive strengths to be expected were entirely governed by the ratio of water to the volume of cement used in the mixture. It needs emphasis here, however, that the well-known water-cement-ratio compressive strength curve established by Prof. Abrams is an average curve from which there may be deviations. For illustration, all the following factors may influence the strength of concrete at a given age, in addition to the influence of the water-cement ratio.

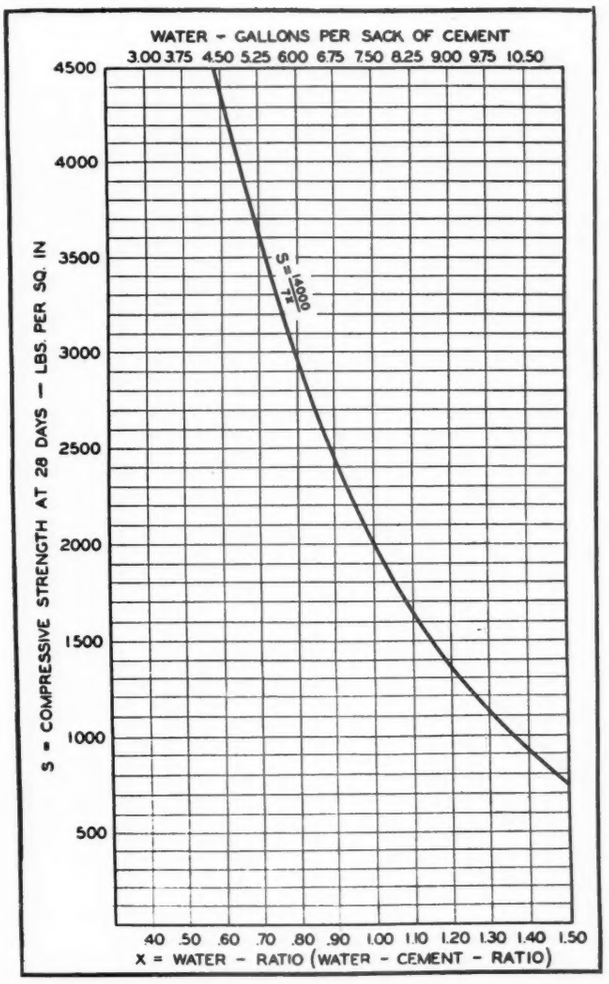


Fig. 2. Effect of quantity of mixing water on the strength of concrete.

a. the character of the cement.
b. The character of the aggregate used.
c. The temperature at which curing takes place.
d. The character of the curing.

It is not safe to follow blindly the water-cement ratio law shown in Fig. 2 and established originally by the Portland Cement Assn. without taking into consideration at least the four factors above mentioned, and it is very important that ready-mixed concrete producers understand this in order that they may produce concrete most economically and fully satisfying the requirements of the specifications.

The fact that there are deviations from the gen-

eral water-cement-ratio law laid down by Prof. Abrams does not at all discredit or render useless the principles which he has established. On the other hand, the recognition of these deviations renders the principles all the more useful. It will be worth while to consider in some detail just what effect these deviations have and to point out how they may be taken into account in the proper design of concrete.

The strength of almost all Portland cements has been increased in recent years and at the present time we have a number of cements purposely designed to attain their strength at early periods. Even among the standard brands of Portland cement there is a variation in the rate of gain in strength.

At an age of seven days the compressive strength of one cement may be more than double that of another and at 28 days one cement may have a compressive strength of 5,000 lb. as against only 3,000 lb. for a cement of lowest type. There is a tendency, however, for all cements to approach more closely the same strength at the age of one year and later.

Obviously, if these different cements are used in concrete made with different water-cement ratios, the relation between the compressive strength and the water-cement ratio would not be expressed by a single curve, such as in Fig. 2; but there will be a separate curve for each of the cements used. It is important, therefore, that the ready-mixed concrete producer establish or have established for him the water-cement-ratio compressive-strength relation for the particular cement with which he is working.

Aggregates—not only coarse aggregates, but fine aggregates as well—vary in their characteristics. These variations include not only gradation, but variations in moisture content, in degree of cleanliness—including the presence of surface coatings—in absorption, in degree of angularity and roughness of surface, and in the possible presence of deleterious materials, such as unsound particles, organic materials, clay lumps, and coal. All of these deleterious materials and characteristics have their effect on the strength of the resulting concrete.

Thus, for illustration, the presence of water in the aggregates influences the water-cement ratio

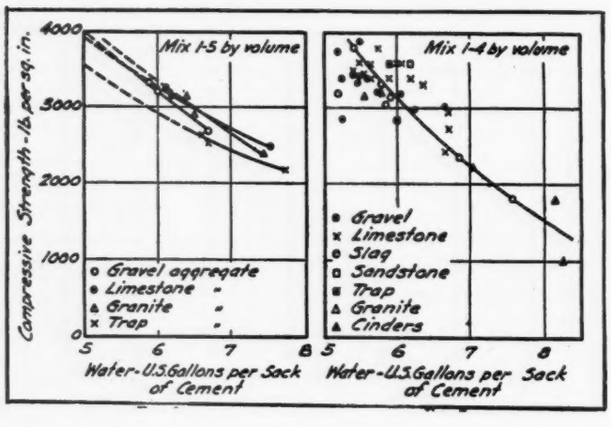


Fig. 3. Effect of type of aggregate on the water-cement ratio strength relation.

which is effective in controlling the strength, as does also the amount of absorption of the aggregates. The former has a detrimental effect; the latter generally is beneficial. Highly-polished aggregates may have a detrimental effect in lowering the strength, particularly the beam or transverse strength of concrete, because of the decreased bond between the mortar and the coarse aggregate. Rough aggregate may furnish a better bond. Coatings which are difficult to remove naturally decrease the strength of the concrete because of the decreased bond.

The gradation of the aggregate has its influence, particularly in affecting the workability of the concrete; and this is especially true in the case of fixed proportions rather than in the case of the designed mix. The gradation of aggregates does not seem to be a highly important factor when latitude is allowed in the proper combination of fine with coarse for the attainment of the desired degree of workability. Gradation may have an important effect on economy.

In Fig. 3 is shown a set of water-cement ratio curves applying to the respective aggregates used in the particular tests from which these curves were plotted. Each aggregate has its own water-cement

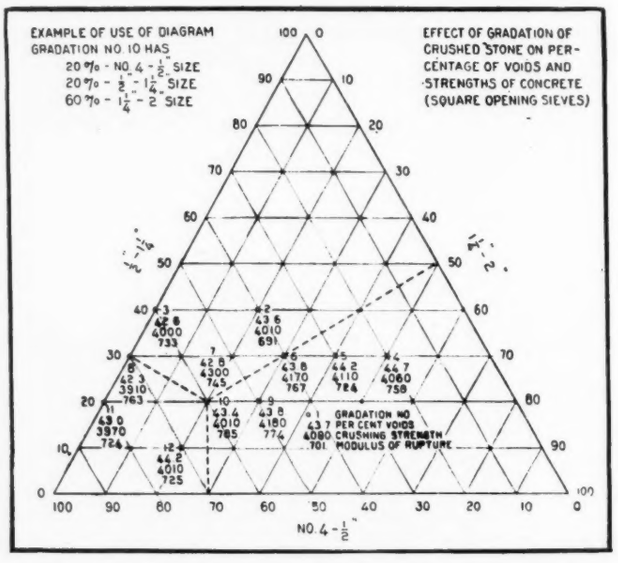

EXAMPLE OF USE OF DIAGRAM
GRADATION NO. 10 HAS
20 % - NO. 4 - 1/2" SIZE
20 % - 1/2" - 1 1/4" SIZE
60 % - 1 1/4" - 2" SIZE
EFFECT OF GRADATION OF CRUSHED STONE ON PERCENTAGE OF VOIDS AND STRENGTHS OF CONCRETE (SQUARE OPENING SIEVES)
GRADATION NO
PER CENT VOIDS
CRUSHING STRENGTH
MODULUS OF RUPTURE
NO. 4 - 1/2"
1/2" - 1 1/4"
1 1/4" - 2"

Fig. 4. Effect of grading of crushed-stone on percentage of voids and strengths.

ratio curve, and this is the important fact to remember. The aggregates, however, do not play as important a part in the compressive strength of concrete as is the case with transverse strength; but, in any event, whether the concrete is designed for compression or for beam strength, full account should be taken of the kind of aggregate employed. This is accomplished in the method of design later proposed, in this paper.

In Fig. 4 is shown the results of studies made to determine the effect of gradation of coarse aggregate on the strength of the resulting concrete. The results are plotted on a triaxial diagram for convenience in showing the variations in gradation. It is to be noted that considerable variation in the

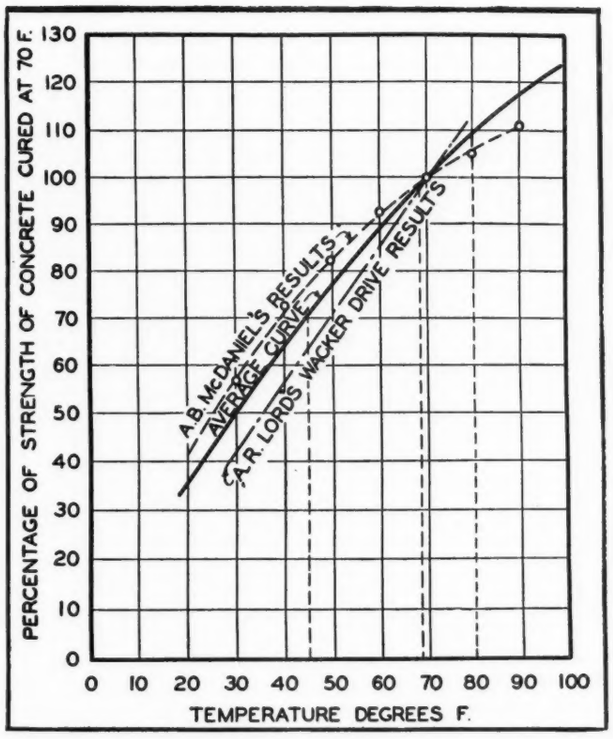


Fig. 5. Effect of curing temperatures on 28-day compressive strength.

percentage of the various sizes used does not seem to show any great variation in either the compressive or transverse strength of the resulting concrete. All the concretes had approximately the same cement content, six bags per cubic yard; and all were mixed to about the same consistency, using proportions of 1:2:3½ by dry, loose volume.

Obviously, those surface coatings which are not displaced in the concrete mixer must affect the bond of the mortar with the coarse aggregate, and, therefore, seriously affect the strength of the concrete. Some clay coatings are of this nature, and perhaps also some types of dust coatings have the same effect. Not all dust-coated stone, on the other hand, affects the strength of concrete, as proved by tests made by the writer and published in the 1929 and 1930 proceedings of the American Society for Testing Materials, under the report of Committee C-9.

Perhaps enough has been said, however, to show that aggregates do play their part in affecting the final strength of the concrete. Accordingly, when determining the proper proportions to use, it is essential that this determination be made with the particular aggregates being employed in the mixture.

The hydration of cement is a chemical activity; and, like other chemical activities, it is accelerated by higher temperatures. The tests on the effect of curing temperatures on the compressive strength of concrete are rather meager.

It is commonly known, however, that the strength of concrete is reduced by lower temperatures and is increased by high temperatures. This point was brought out by A. R. Lord and recognized by him in his control of the concrete used on the Wacker Drive in Chicago. Tests made many years ago by Prof. A. B. McDaniel at the University of Illinois Engineering Experiment Station also show the effect of temperature on the strength of concrete. The results of these experiments and those obtained by Mr. Lord are shown in Fig. 5.

It is obvious from this curve that, if the concrete is designed to have a given strength at 70 deg. F., it would have only 70 per cent of this strength at 45 deg. F., while at 90 deg. F. it would have 117 per cent of its strength at a temperature of 70 deg. F. Obviously, then, the curing temperature is something which must certainly be taken into account in the design of concrete. Cold-weather concrete demands a lower water-cement ratio than hot-weather concrete, in order to compensate for the effect of the low temperature in reducing the compressive strength. The manner in which this compensation might be effected is discussed under the question of concrete design.

It has been shown by a number of investigators that the manner of curing concrete plays a most important part in affecting its strength. This fact must be entirely apparent when it is considered that the hydration of the cement continues in the presence of water and stops when there is no moisture present. Moreover, the hydration of the cement results in the combination of additional water with the cement, and, therefore, in the creation of additional solid material within the concrete structure. That this is the case is readily shown by the very marked influence of additional curing on the permeability of concrete. The effect, not only of the water-cement ratio, but also of the amount of curing, is well indicated in Fig. 6.

It is to be noted that, as would be expected, the higher the water ratio, the more permeable is the concrete, for reasons which have been previously explained. Moreover, it is seen that, although concrete may be quite permeable at an early period, it gradually develops a low degree of permeability with age under moist-curing conditions. The two most important factors for controlling the permeability of concrete are the water-cement ratio used in the original mix and the degree of curing given to the mix.

It might be thought that the responsibility of the ready-mixed concrete producer ends after he has delivered the concrete to the job and that the kind of curing given is a responsibility to be assumed by the engineer and the contractor. However, if the ready-mixed concrete producer is to be entrusted with the design of concrete for a particular purpose, he must take into account all of the conditions to which that concrete is to be subjected and which influence its suitability for the particular purpose intended.

Curing plays a most important part in influencing the strength and permeability of concrete, and it is highly important that the concrete producer know the kind of curing specified and that he design his concrete accordingly. There his responsibility ends as far as this particular feature is con-

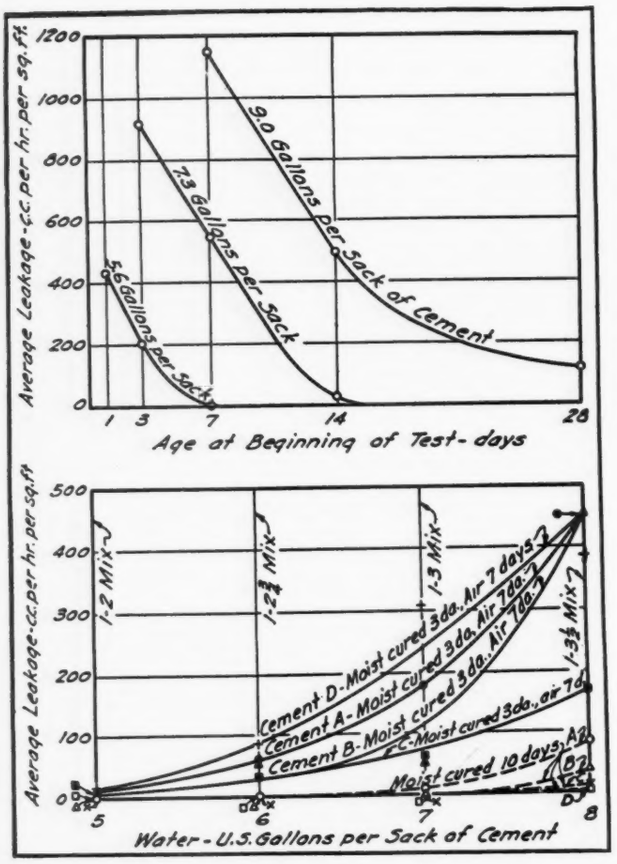


Fig. 6. Effect of water content and curing on permeability of concrete.

cerned, and it is then the responsibility of the engineer and contractor to see that the concrete is cured in accordance with the specifications.

The durability of concrete is influenced by a number of factors, among which may be mentioned the soundness of the cement and of the fine and coarse aggregate used; but even when the separate ingredients are perfectly sound there is still the chance of the concrete being nondurable. If we use a high amount of water in mixing the concrete there is bound to be a high percentage of free water in the mixture, with a resulting high percentage of pore space in the hardened concrete when this free water evaporates. There is nothing which makes for lack of durability of concrete so much as the use of too much mixing water; and this feature, by all means, is to be guarded against.

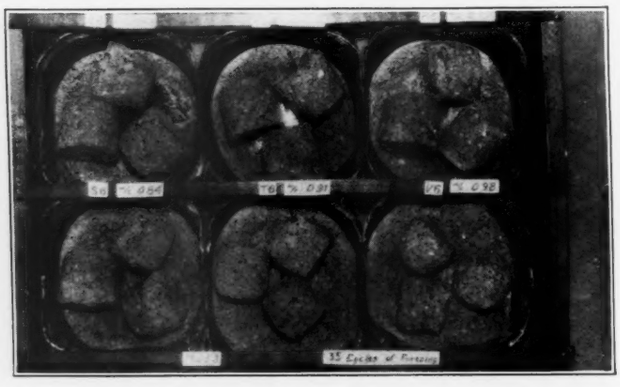


Fig. 7. Results of freezing tests with various water-cement ratios.

A striking illustration of the influence of the mixing water is given in Fig. 7, in which is shown the results of freezing tests on Portland-cement mortars made in our own laboratory using different water-cement ratios, and employing a cement and a sand which were both sound. The point to be noticed in the accompanying figure is that the wetter the mixture, the more rapidly has disintegration proceeded. It is difficult to lay down any hard and fast rules as to what the water-cement ratio should be for various kinds of exposure and various types of structure, for this will vary throughout the United States. The Portland Cement Assn. has suggested the following values for general use:

TABLE I

Maximum Quantity* Mixing Water, U. S. Gal. per sack of cement (94 lb.)	Type of Structure or Degree of Exposure
6	Roadways, piles, pressure pipes, and tanks. Thin structural members in severe exposure. Walls, dams, piers, etc., where exposed to severe action of water and frost.
6¾	Sewers, bridges, walls, dams, piers, etc., for all weather conditions and moderate action of water and frost.
7½	Ordinary inclosed reinforced concrete buildings. Bridges and retaining walls of heavy sections in moderate exposure.
8¼	Mass concrete, basement walls, etc., protected from water or severe weather conditions.

* Free water or moisture carried by the aggregates must be included as part of mixing water.

Having considered the principal factors which control the strength, durability, and permeability of concrete, we are now in a better position to proceed with the formulation of a method for the design of the particular kind of concrete desired. The method of design which I would advocate as being the simplest and most practical is that known as the method of trial mixtures.

Let it be assumed that we are to design concrete for a given compressive strength. It has been shown that the compressive strength is controlled by a number of different factors, the principal one of which is the water-cement ratio used with the particular cement and aggregates in the mixture. Still another is the kind of curing used; a third involves the temperature at which the curing is given.

As has been noticed there are several factors which control the compressive strength of concrete, and the producer must know the exact conditions under which the concrete is supposed to attain the strength desired. The most usual condition is that in which the concrete is specified to have the desired strength when moist cured at 70 deg. F. We shall let this condition be known as Case One. The second condition, which we shall call Case Two, is that in which the concrete is supposed to attain a given strength as it is actually cured on the job, the strength in this case being checked by means of job-made and job-cured cylinders.

Case One

The first procedure is to establish a water-cement-ratio compressive-strength curve, using the particular materials employed in the ready-mixed concrete plant. This is a laboratory job which should

be performed carefully by a laboratory accustomed to this sort of work.

Let it be assumed that curve No. 3 in Fig. 8 represents the water-cement ratio compressive-strength for any particular material which may be under consideration. From this curve the desired water-cement ratio which will produce concrete of the required strength may be selected. For illustration, if 3,000-lb. concrete at 28 days is required, the water-cement ratio needed is 0.96, or approximately 7.1 gallons per sack of cement.

The next step consists in determining the proportions of concrete which with this water-cement ratio will give the consistency desired for the job. This is best done by making up trial batches of concrete. In this work the following procedure is used:

First mix up a convenient amount of cement with the quantity of water required by the selected water-cement ratio, in this case 0.96, or 7.1 gallons per bag of cement. Fine aggregate and coarse aggregate are then mixed with this paste, adding these materials cautiously, until finally the right consistency, as required of the concrete is finally obtained.

For the sake of economy it is desirable to add as much coarse aggregate as possible without sacrificing the necessary workability. If the mixture finally obtained has the right consistency but appears to be too harsh working, this simply means that there is too little sand and too much coarse aggregate, and a new trial batch will have to be made in which the amount of sand is increased and the coarse aggregate decreased.

Finally, by the use of several trial batches of this nature, a concrete mixture will be arrived at which has the right water-cement ratio and the right degree of workability for the particular purpose intended. By carefully pre-weighing each of the separate ingredients composing this trial batch, the exact proportions of each of these materials may be obtained and concrete made in these proportions and cured at 70 deg. F. under moist conditions should give very closely the compressive strength desired.

The cement content per cubic yard of this mixture may be determined very closely by filling a half-cubic-foot measure with the mixture and obtaining its weight. Knowing the weight of each of the separate ingredients in the batch, and knowing the weight of concrete in the half-cubic-foot measure, the exact weight of each of the materials in the half-cubic-foot measure may be readily obtained by direct proportion; and from this the exact weight of each of the materials in a cubic yard of the concrete may also be obtained by direct proportion.

Case Two

The proportioning of concrete to have a given compressive strength under job conditions of curing.—The ready-mixed concrete producer may be called upon to furnish concrete which will have the required strength under the actual conditions encountered on the job, as determined by job-cured and job-made cylinders. The procedure in this case is the same as in Case One; but, in addition, the water-cement ratio as determined under Case One must be corrected so that it will give the desired strength under the job conditions of curing. The temperature of curing is a very important factor in affecting the strength of the resulting concrete, and under Case Two the temperature of curing must be taken into account. This is done by making use of the data shown in Fig. 5.

The procedure is as follows: It will be assumed that we have established the water-cement ratio compressive strength curve for cylinders cured under laboratory conditions, that is, 70 deg. F. in moist air. According to the data given in Fig. 5 we may expect higher strengths at temperatures higher than 70 deg. F. and, correspondingly, lower strengths when the temperature is lower.

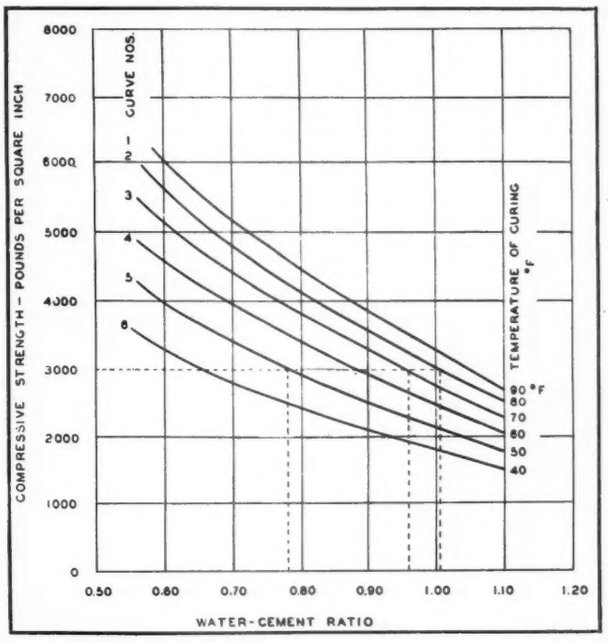


Fig. 8. Water-cement ratio—compressive strength curves.

Making use of the data in Fig. 5, we may plot water-cement ratio curves for the respective temperatures as shown in Fig. 8; and with these curves in Fig. 8 we are now in a position to determine what water-cement ratio we should use to obtain the desired compressive strength at the expected curing temperature.

To illustrate this point, let it be assumed that the curing temperature to be expected is 50 deg. F. and that we desire to obtain concrete having a compressive strength of 3,000 lb. per sq. in. at 28 days. Referring to Fig. 8, you will see that, for these conditions, we should have to use a water-cement ratio of approximately 0.78 or 5.85 gal. of water per bag of cement. If we expect the curing to be 80 deg. F., it will be seen from the curve that we may use a water-cement ratio of approximately 1.0 for a compressive strength of 3,000 lb. per sq. in., or 7½ gallons per bag of cement.

Here we assume that the curing actually given on this job will be the same as that given in the laboratory, so far as moisture conditions are concerned. Although this condition seldom obtains, neverthe-

Table II—RECOMMENDED WATER-CEMENT RATIOS FOR CONCRETE TO MEET DIFFERENT DEGREES OF EXPOSURE

Degree of Exposure	Water-Cement Ratio (*U. S. gal. per sack.*)*		
	Reinforced piles, thin walls, light structural members.	Reinforced reservoirs, water tanks, pressure pipes, sewers, canal linings, dams of thin sections.	Heavy walls, piers, foundations, dams of heavy sections.
Extreme: 1. In severe climates like in Northern U. S., exposure to alternate wetting and drying, freezing and thawing, as at the water line in hydraulic structures. 2. Exposure to sea and strong sulphate waters in both severe and moderate climates.	5½	5½	6
Severe: 3. In severe climates like in Northern U. S., exposure to rain and snow, and freezing and thawing, but not continuously in contact with water. 4. In moderate climates like Southern U. S., exposure to alternate wetting and drying, as at water line in hydraulic structures.	6	6	6¾
Moderate: 5. In climates like Southern U. S., exposure to ordinary weather, but not continuously in contact with water. 6. Concrete completely submerged but protected from freezing.	6¾	6	7½
Protected: 7. Ordinary inclosed structural members; concrete below the ground not subject to action of corrosive groundwaters or freezing and thawing.	7½	6	8¼

*Free water or moisture carried by the aggregate must be included as part of the mixing water.

less there is a saving factor in that concrete specimens are tested in the laboratory generally in a moist condition, while the concrete on the job is in a drier condition and hence is actually stronger than the strength shown by wet cylinders. Cylinders tested wet have only about 80 per cent of the strength of the same concrete tested dry.

It is seen that the water-ratio plays a most important part, not only in the compressive strength, but in the durability and in the permeability of concrete; and hence, it is highly important the proper water-ratio be used for the particular class of structure for which the concrete is being made. Considering all the accidental variations to which concrete is subjected in its manufacture and curing, and considering, in addition, the great variations in exposure, it would be an almost impossible task to set up a set of requirements for a water-cement ratio which would meet the exact conditions for any one job.

General observation, however, has led to the selection of water-cement ratios which, in the judgment of experienced observers, may be depended upon to give satisfactory results. Perhaps no better statement of desirable water-cement ratios for different classes of construction has been made than that by F. R. McMillan in his book entitled "Basic Principles of Concrete Making," from which the following table is taken.

It should be pointed out that these water-cement ratios are the net water-cement ratios available for the hydration of the cement after properly correcting for the absorption of the aggregate or for the free moisture on the aggregates.

In a paper of this nature it is quite impossible to go into the many details of laboratory procedure which might be desirable, nor is it possible to cover fully the many variables which may affect the strength of the concrete. It is hoped, however, that the essential points have been covered; and with the procedure described herein it should be possible for the concrete producer to arrive at the desired proportions of concrete in the simplest and most practicable manner.

Nitrate Deposits in Southwest Not of Commercial Value

The U. S. Geological Survey has just published a report on nitrate deposits in the Southwest, chiefly in California, the result of investigations carried on mostly during the World War but continued intermittently since that time and recently completed.

The present report, which was written by L. F. Noble, is Geological Survey Bulletin 820, obtainable for 45 cents from the Superintendent of Documents, Washington, D. C. It includes descriptions of fourteen localities in southern California, two in Nevada, and one each in Arizona and New Mexico. In the Nevada localities, and in most of those in California, the nitrate occurrences studied were caliche deposits associated with clay hills—that is, blanket deposits of salts lying mostly within a foot of the surface and only a few inches thick. The low percentage of nitrate present in most of these salts, together with the irregular and patchy distribution of the caliche, renders all the deposits valueless commercially, although at one place caliche containing as much as 15.6 per cent. of sodium nitrate was found. Material of this grade, however, was highly exceptional; the great bulk of the caliche yielded less than 2 per cent. of sodium nitrate, and much of it less than 1 per cent. The work showed that richer bodies of nitrate at depth were not to be expected.

Three of the California localities were playas or so-called dry lakes, which are moistened by occasional rains. One of these yielded no nitrate and the others bare traces of nitrate.

At some of the California localities there were in addition to the caliche deposits cave or ledge deposits occurring in neighboring hills of volcanic or other types of rock. The occurrences examined in Arizona and New Mexico were also of the cave or ledge type, associated with volcanic rocks.

Spalls on the receiving platform before crushing.

Stock-pile of pulverized marble. Scrap stone in background.

Marble Chips for Use as Aggregate in Terrazzo Enjoy Popular Demand

Plant at Knoxville, Tenn., Ships 5,000 Tons Annually to Builders Everywhere

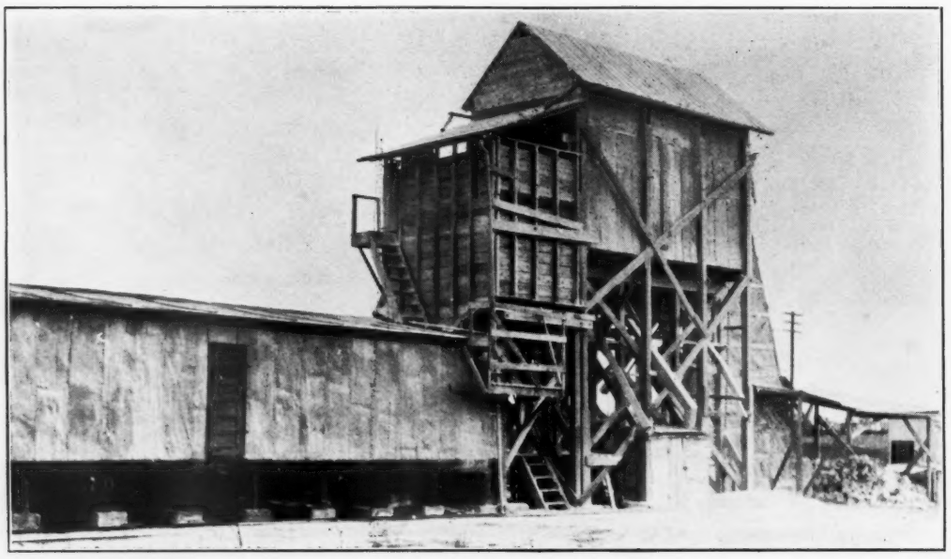
WHILE terrazzo floors and interior finish are now quite generally used in modern commercial and residential buildings, few people realize that the fine white and colored stone used in making them is a by-product of the marble industry and comes from a crushed-stone plant. The quarrying of marble produces considerable waste stone; in fact, the disposal of the undesirable boulders and other unfit material becomes a serious problem at many quarries. Because of faults, pockets, upheavals and similar conditions in the quarry ledges, a large percentage of the marble produced must be cast aside. In the eastern Tennessee marble region, which is one of the largest producing centers in the country, numerous by-product plants have arisen to make use of this waste material. As marble is quite fit for the production of lime, the Knoxville district is noted for its lime plants, most of which use waste marble as a raw material.

One marble by-product plant, that of the Knoxville Crushed Stone Co., Knoxville, Tenn., is engaged in the production of "Granito" stone, which is the brand name of three grades of marble chips of various colors. This company, which is a partnership of three men, was organized six years ago when the need for a reputable marble-crushing plant became evident. These men are A. H. Whisman, a prominent Knoxville contractor, W. E. Johnson, and W. K. Johnson. W. E. Johnson is manager of the company.

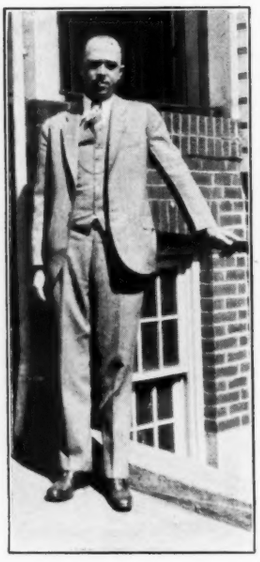
Tennessee marble varies in color, there being several shades of pink, gray to blue, and cedar. To meet the demand for terrazzo stone in these colors, the Knoxville Crushed Stone Co. has three plants, each located at the source of a certain colored marble. At the Asbury plant a gray stone is produced; at the South Knoxville plant, light and dark pink stone; and at the Concord plant, a cedar-colored stone. Imported marble of other colors is crushed for special orders.

Individually, the plants are quite small in capacity when compared with the usual limestone quarry operation. Nevertheless, each plant is a complete unit in itself, with a power-plant, crusher, screening apparatus, loading bins, and a warehouse. The Concord plant includes a quarry operation, the cedar-color stone being drilled and blasted in the usual manner and sent to the plant for crushing.

The enclosed pulverizer installation. Wooden chute returns oversize rejects to pulverizer feeder entry.



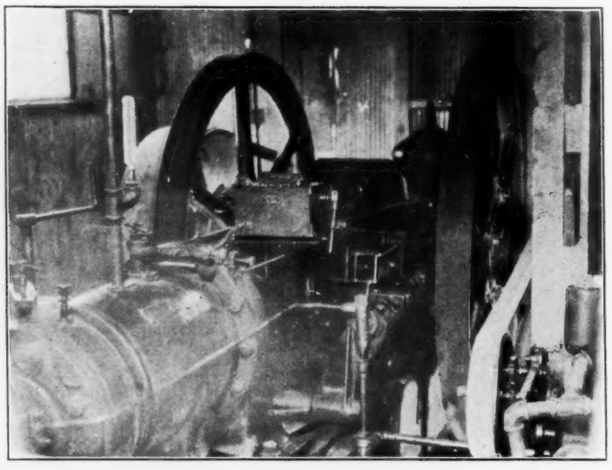
The Asbury plant. Warehouse at left. Receiving platform at right.



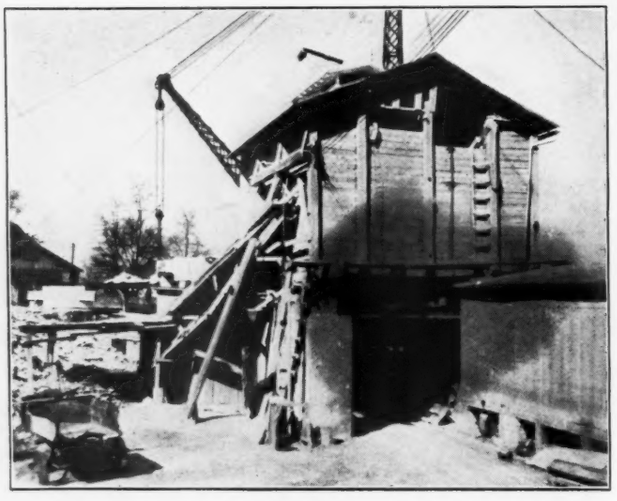
W. K. Johnson.

Taking the Asbury plant as typical of all three, a description will reveal its processes. Gray-colored stone is quarried at the location of this plant, the quarry being operated by the Knoxville Gray-Eagle Marble Co. Spalls of the waste material are made at the quarry and loaded into a wooden "scale box" which is mounted on a quarry-car chassis and moved by hand on tracks across the road to the Asbury plant. A steel gravity-dump car is also used for this purpose. Two tracks extending from the quarry across the highway to the plant provide sufficient facility for the transportation of the spalls to the plant receiving platform, which is on ground level. In the center, a small 9-in. by 12-in. opening provides an entry to the pulverizer located beneath.

Terrazzo finish requires the use of small, pebble-like chips without feather edges or splinters. The surface treatment, being a grinding process, will quickly tear out feather-like and splinter-like stones, leaving small cavities in the finished surface. To prevent this, the marble spalls are crushed in a hammer-type pulverizer. Each of the three Knoxville Crushed Stone Co. plants is equipped with a Day Pulverizer Co. No. 2 Model E pulverizer, set at ¾-in. and under breakage. Each machine is installed beneath the receiving platform, and is fed by hand or shovel. Spalls of a size larger than the feeder-hopper of the pulverizer are cracked by hand sledging. The discharged material from the pulverizer is then carried to a rotary screen by means of a 12-in. elevator which has a center-to-center length of approximately 25 ft.



Semi-Diesel engine which supplies power to the entire plant.



South Knoxville plant. Pile of raw material at left.

Three sizes of chips are normally produced by the company, known as No. 1, 2, and 3, which are 3/16 in., ¼ in., and ⅜ in. in size, respectively. The screenings, material of 12-mesh screen-cloth size, are sold for cast-stone aggregate. The rotary screen is 3 ft. in diameter and 18 ft. in length. It has four screen sections mounted on it to produce the three market sizes of stone and the "fines." The latter are further divided on a shaker screen to produce 12-mesh material and agstone.

From the screens the material is spouted to five

(*Continued on page 48*)

Core-Drilling Reveals Both Quality and Extent of Underground Deposits

By L. D. COOPER
General Manager, Longyear Co.

WITH a yearly production of more than 400,000,000 tons, having a value in excess of $1,250,000,000, the non-metallic-minerals industry is engaged in "big business." Every state in the Union contributes to this rising tide of wealth, with one—California—producing nineteen of twenty-three more common non-metallic minerals.

In the face of this enormous production, known mineral supplies no longer seem inexhaustible and the question of future reserves is becoming increasingly important. Most non-metallic minerals have a large place or location value, as their prices are too low to permit high transportation charges. Accessibility to market is a prime requisite, and known supplies do not constitute reserves unless they are favorably situated. Future supplies will come from present operating properties and their extensions, from known deposits now held in reserve or too far from markets to have any present worth, and from additional discoveries. How are these unknown or merely suspected deposits to be converted to reserves?

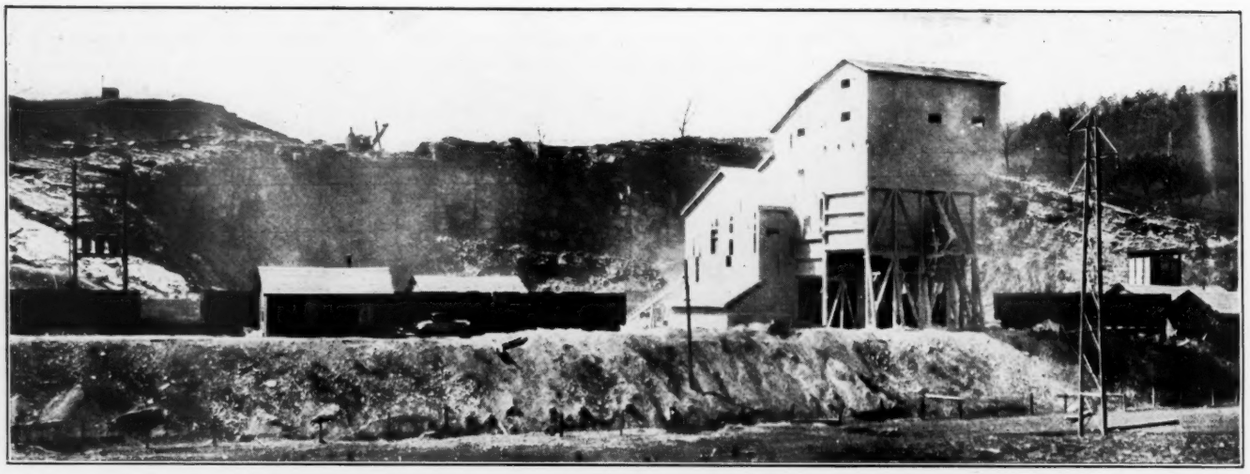
For the past fifty years the core-drill has been an efficient instrument in the hands of the metal miner in locating ore-bodies and determining their extent and quality. The non-metallic-mineral producer has been slower to adopt this tool, partly because his raw material was more widely distributed and lay close to the surface, and partly because it had such a low value that he had little margin for investigations and explorations. Lack of large markets and high transportation costs led to the development of many small operations with limited resources and a lack of the technical advice which the metal miner had at his command. With increased demand for his product and more rigid chemical and physical requirements on the part of the consumer, the non-metallic-mineral operator is coming to realize more and more the necessity of knowing exactly what he can produce, both as to quantity and quality, over a sufficient period of time to justify his investment in property and plant.

The core-drill unquestionably is the most efficient, rapid and, in view of the results obtained, the most economical means of exploring mineral deposits. The machine itself is simple and core-drilling methods are neither mysterious nor complicated. A power unit—electric motor, steam or gas engine—through a system of gears, transmits a rotary motion to a string of hollow rods, at the lower end of the lowest of which is a cutting bit, fed downward as it revolves under pressure of a hydraulic cylinder or screw feed. The cutting medium may be black diamonds, bortz, alloy-steel or chilled-steel shot, which cut an annular ring into the rock and, as the bit advances, force a cylindrical core up into the drill stem to be pulled to the surface as desired. During the drilling operation, a continuous stream of water is forced down through the rods, washing up the cuttings and cooling the bit. Overburden, such as sand, clay or gravel, is cased off by washing or driving a pipe through it and far enough into the ledge to prevent it from running into the hole and interfering with the core drilling. Core up to 24 in. in diameter or even larger may be taken, although in non-metallic-mineral exploration, it is rarely necessary to recover core larger than 3 or 4 in.

The value of core-drilling depends to a great extent on the care used in recovering reliable samples and the use to which such samples are put. The drill hole itself has little value, and accurate samples, stored unmarked in a warehouse, or left at the drill location without examination or tests, are not worth their cost. The drill samples and the log of the hole furnish definite information as to the depth and thickness of the deposit, the depth and character of the overburden, the dip of the rock strata and their hardness and soundness. The core is available for chemical analysis and such physical tests as weight, hardness, crushing strength, and wear. From the core-drilling results estimates of tonnage can be made, operating plans developed, and reliable cost estimates prepared. The plant can be properly designed and located, trackage with suitable grades laid out, permanent provision made for the disposal of overburden and waste rock, and sales policies formulated with the assurance that customers' requirements will be met. Barren lands can be disposed of, saving the payment of needless taxes, while financing plans and the appropriation of funds for development can be considered intelligently. Estimates and detailed plans take the place of guesswork; costly changes during development and construction are avoided.

Diamond core-drilling is usually carried out with a crew of two or three men, one of whom should be an experienced operator. In soft formations, a single bit can be used for a number of shifts before it must be reset, and the drill operator sets his bits as required, usually when the drill is being moved from one location to another. In granite, trap-rock and other hard formations, a diamond setter is employed to set the bits for one or more drills which are usually operated on both day and night shifts.

(*Continued on page 52*)



The Southern Limestone Co. plant with quarry in background.

Track System at Crushed-Stone Quarry in Tennessee Being Simplified

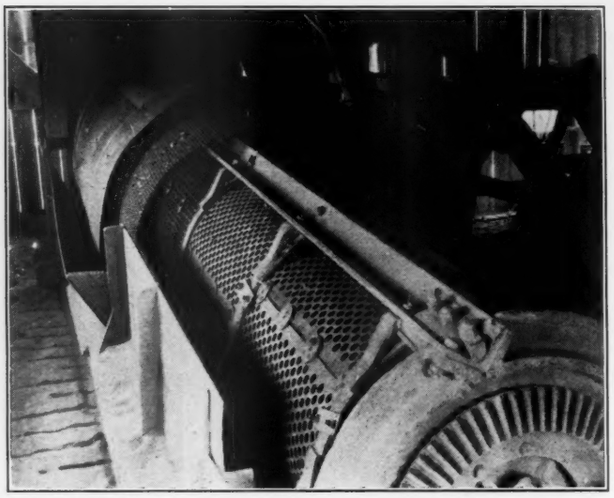
Fan-Shaped Maze of Rails Replaced by Improved Forward and Return Trackage

TYPICAL of southeastern quarry operations is the Southern Limestone Company's plant at Harriman, Tenn. Being located adjacent to the Walden Ridge of the Cumberland Mountains, the bed of rock quarried by this company follows the general contour of deposits in mountainous country—an upheaval with an angle of repose of approximately 20 deg. With this condition, drilling and blasting operations present a more difficult problem than in a quarry with a horizontal-strata deposit, especially so when a high yield of stone per pound of explosive is placed at a premium.

This plant has been in operation for four years. During three of these years it was in operation day and night to meet the demand for crushed stone in this area. In this period, the plant has been expanded in steady, progressive stages, and, while still small, it is not overbuilt and is in a position to show a good profit on its investment. Its present capacity averages 700 tons per 10-hr. day.

Possibly the cost of labor has influenced the development of the Southern Limestone Company quarry. Here labor is relatively cheap, and the loading and transporting of blasted rock have been done largely by hand. To produce the tonnage of stone required, the face of the deposit was blasted in a semicircular fashion, allowing the use of a fan-system of tracks to give access to the blasted rock. With 32 points of loading, a maze of tracks resulted, and at the present time this system is undergoing a simplification. Eventually, it is hoped to replace the hand loading with motor-truck or locomotive-and-car transportation.

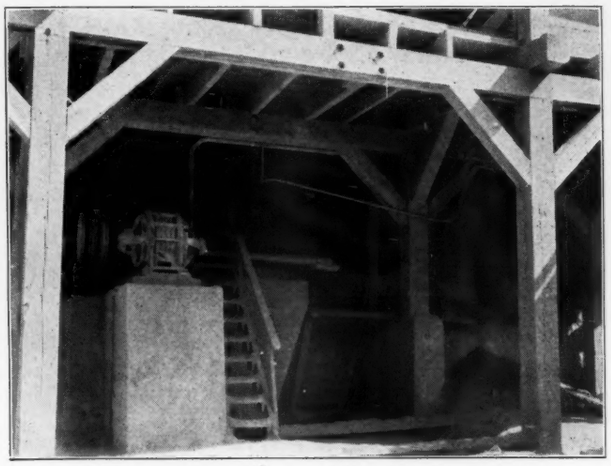
Shovel stripping overburden. Waste pile at left.



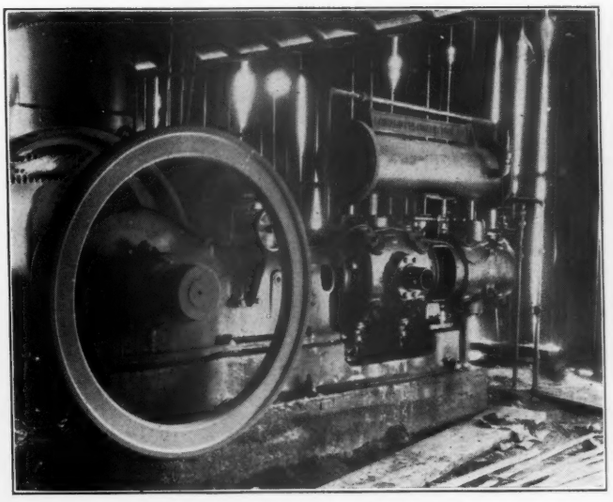
Triple-jacketed screen used for primary classification.

The overburden at this quarry varies from a negligible amount to a depth of 8-ft. over certain sections, averaging about 4 ft. Stripping is done with an Erie 1-cu.yd. shovel and the waste material is loaded into 2-cu.yd. side dump cars and hauled to a near waste dump by means of a converted Fordson tractor-locomotive.

For several years the well-drill method of drilling was used with but a fair degree of success. Employed in pitching strata such as encountered at this location, this method is not held by authorities to be the most advantageous because of the high secondary-blasting costs. Well-drill shooting at this quarry had a tendency to roll large boulders from the formation and the shattering effect secured was not sufficient to reduce them to a desirable size. During the past year, the bench method of drilling and blasting has been used and much better results have been obtained. Using Ingersoll-Rand Jackhamer drills, two or three rows of staggered holes are drilled to an average depth of 20 ft. These holes are spaced approximately 10 ft. on centers and 8 ft. from the face. From 30 to 60 holes are fired at one time with any one of three makes of explosives, Hercules, DuPont or Atlas. In spite of the pitched-strata condition, this method of quarrying has resulted in a yield of greater than 4 tons of rock per pound of explosive and secondary shooting has been reduced to the minimum.



The secondary and primary crushers.



One of the air compressors in operation.

As mentioned, the blasted rock is loaded by hand into quarry cars and delivered to the plant by hand. The original system resembled the spokes of a wheel, tracks extending from the plant hoist as a hub to the 32 points of the quarry face as a rim. As can be expected, considerable loss of time resulted due to the cars accumulating at the hoist. While one car was being raised to the plant, others arriving would be forced to wait for the return of that car and its subsequent withdrawal from the main incline track. Under the supervision of W. P. Luker, the present superintendent, the entire track system is being rebuilt. The quarry floor will be divided roughly into halves; with a separate forward and a separate return track for each half. The forward track will extend from the incline toward the quarry face with a sweeping curve to the farthest working point of the quarry. Individual sidetracks will be extended from this main track to each of the working points.

The system employed at present requires 64 men in the quarry, two men at each working point.

Drilling with jackhammers on a bench in the quarry.

View of the quarry floor showing the extensive track system.

Blacksmith at drill sharpener in the shop.

Each man is paid at the rate of 30 c. per car (1½ cu.yd.) delivered to the plant. Some of the workers are able to earn from $4 to $5 per day.

For processing the blasted rock the plant uses a primary and a secondary crusher, two rotary classifying screens, and one rotary classifier for the screenings.

At the incline an Allis-Chalmers friction hoist elevates each car to a point over the Austin No. 7½ gyratory crusher which reduces the stone to 2-in. size and smaller. Both the hoist and the crusher are driven from a lineshaft which also drives one of the air-compressors. From the primary crusher the material passes to the first rotary screen over a 66-ft. belt-bucket elevator with 12-in. by 25-in. buckets. This screen, an Allis-Chalmers 48-in. by 20-ft. unit, has three concentric jackets, requiring 20 ft. of 1⅝-in. mesh wire cloth, 11 ft. of ¾-in. perforated plate and 10 ft. of ¼-in. perforated plate. All oversize "rejects" from this unit are sent to a Symons 4-ft. cone crusher, whence they go to a second screen similar in size to the first one, three sizes of finished material—1-in., ⅝-in. and 3/16-in. being produced.

Six bins, each with a capacity of 50 tons, provide sufficient storage and car-loading capacity. One of the bins, used for "screenings," is equipped with a 12-in. belt-bucket elevator to reclaim them for the separation of agricultural limestone. A small 10-ft. rotary screen, 36 in. in diameter and equipped with No. 8 mesh wire cloth, takes care of this operation.

The principal motor sizes include the following: For the hoist, primary crusher and the 600-ft. air-compressor, a lineshaft drive powered by a 100-hp. motor; for the secondary crusher a 100-hp. motor; for the first rotary screen and elevator a 50-hp. motor; for the second rotary screen a 30-hp. motor.

Other plant equipment includes an Ingersoll-Rand 600-cu.ft. air-compressor and a Chicago Pneumatic Tool Co. 350-cu.ft. air-compressor. The blacksmith shop is equipped with an Ingersoll-Rand drill-sharpener.

Near the plant is located a natural spring, which furnishes sufficient water for all purposes. A Fairbanks-Morse 2-cylinder piston-type pump delivers the water to a gravity tank near the plant.

Another view of the plant.

W. P. Luker.

Produces Marble-Chip Terrazzo

(*Continued from page 44*)

bins, each having a capacity of 20 tons. All market sizes of stone are shipped in 100-lb. bags which are hand-filled by means of spouts from the bins. They are weighed on a small platform scale. Temporary storage before the shipment of the product is provided by a warehouse located adjacent to the storage bins. A sidetrack alongside the warehouse allows car-load shipping.

Two of the plants, those at Asbury and Concord, are operated entirely by means of oil engines. Originally, the need for power required a source other than electricity, because of the lack of convenient transmission lines. A Primm oil engine, as manufactured by the Power Mfg. Co., having a rating of 35 hp., was selected for the first plant and it drives the entire plant equipment through a belt-and-lineshaft system. It is of the semi-Diesel type burning furnace oil, and is started by means of compressed air from two compression tanks. The record of economy of this engine resulted in the installation of another unit of similar size at the Concord plant. The South Knoxville plant is electrically driven throughout.

Because of the extensive use of "Granito" stone, the company enjoys a coast-to-coast patronage. Car-load shipments are shipped all over the country, and principally to the North and East. An average car-load is 30 tons, and the annual output approximates 5,000 tons. All sales are made through brokerage houses in the leading building-material markets. The average retail price per ton is $8.50.

Road-Builders' Proceedings Will Be Published in Condensed Form

The proceedings of the American oad Builders' Assn. this year are published according to a new plan. Instead of publishing complete reports, summaries and conclusions only are presented so that much information may be obtained with little reading. The full reports are published as bulletins.

These proceedings have been adopted as a standard reference work in many techincal schools.

Birmingham Ready-Mixed Concrete Plant in Eighth Year of Operation

Pioneer Producer Adds Third Mixer and New Equipment for Handling Bulk Cement

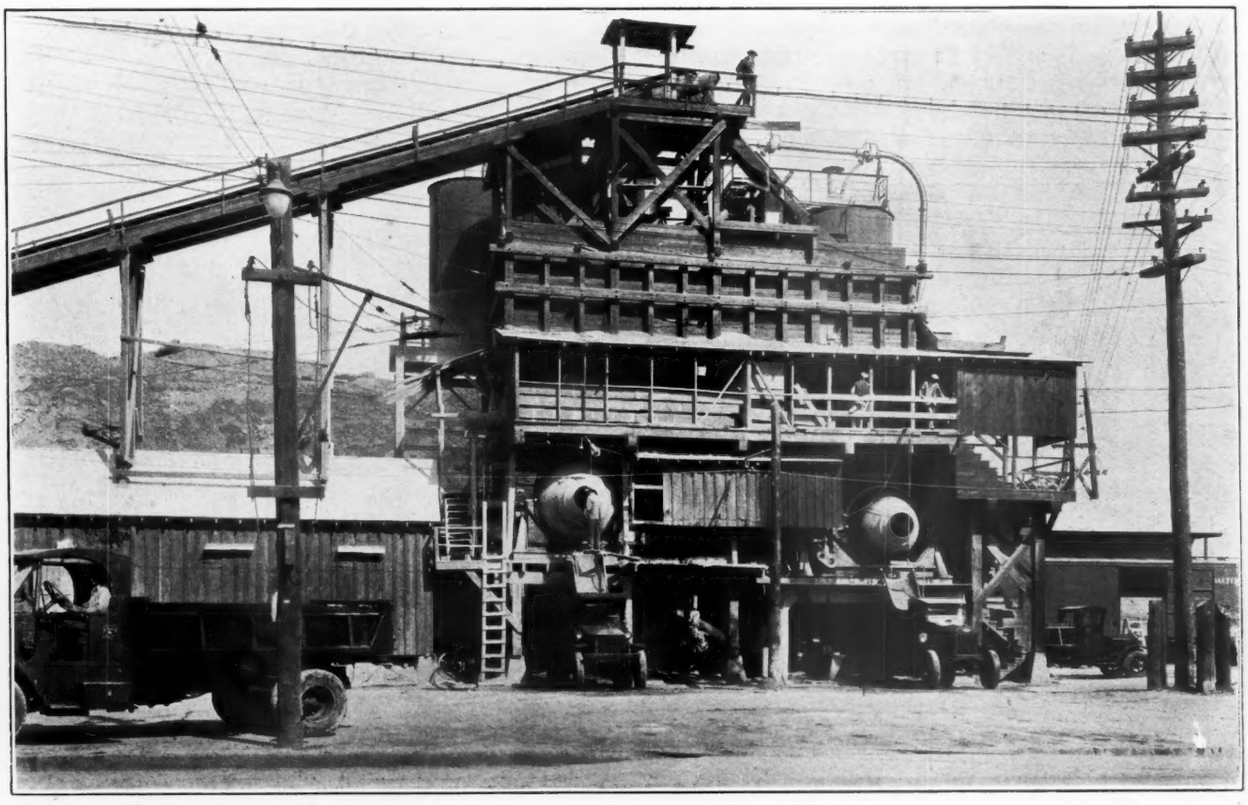
By MAT F. BEISBER

WITH the continued increase in the number of ready-mixed concrete plants all over the country, many prospective owners include Birmingham, Ala., on their itineraries of visit and inspection. This is justly so, as Birmingham is the home of an outstanding plant in this business.

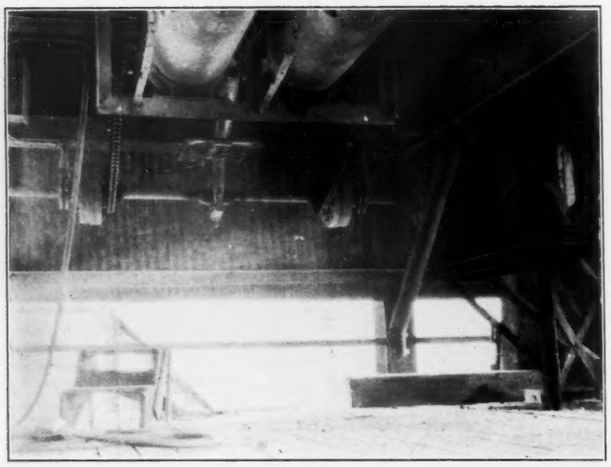
One of the first companies to realize the possibilities of central-mixed concrete, the Sloss-Sheffield Steel & Iron Co. is a pioneer in this industry, having built its original plant in 1924. With years of experience gained before central-mixed concrete was even considered seriously in construction circles, this organization paved its way to success long before the advent of modern batching, mixing and delivery equipment. To-day it is not only a modern plant but one of the largest—capable of mixing 1,500 cu. yd. of concrete in a 10-hr. day, using three mixers. Over 135,000 cu. yd. of concrete was produced in a recent year of normal building activity.

The ready-mixed concrete division of the Sloss-Sheffield company is one of its by-product reclamation activities. With the development of commercial uses for blast-furnace slag, this company built a large crushing and screening plant for the marketing of the slag as concrete aggregate. In 1924, under the direction of J. E. Donelson, the company built its first central-mixing unit adjacent to the screening plant. Since then, the central-mixing division has grown steadily. Its most recent improvements include a third mixer and complete bulk-cement handling equipment.

To cope with many problems of production and delivery—now important topics of engineering research—Mr. Donelson began investigations as early as 1925. The problem of aggregate segregation during the period of delivery caused him to experiment with various proportions of aggregates with a view to producing the minimum of voids in both the coarse and fine aggregates. Continued work along this line led to the use of a mixed sand consisting of 18 to 20 per cent. passing a 50-mesh screen, 25 to 35 per cent. passing screens between 30- and 50-mesh, and 25 to 35 per cent. passing



Front view of the plant showing the two 2-cu.yd. mixers. The third mixer, a 1-cu.yd. machine, does not show in this view.



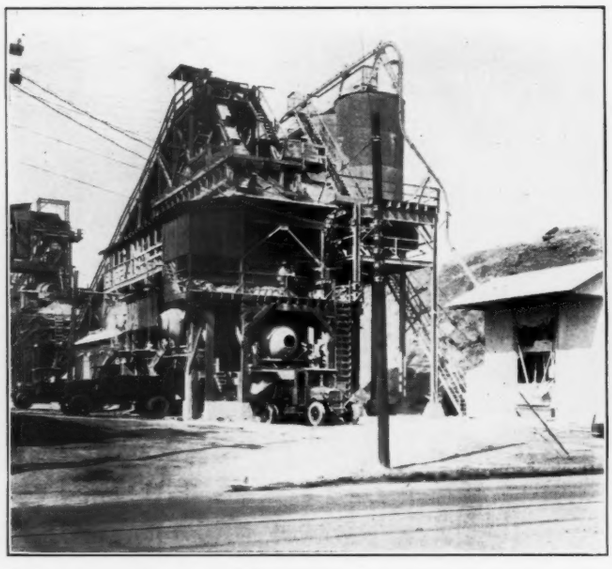
Cement screw conveyors. Note magnetic clutches on the line-shaft.

through screens between 10- and 30-mesh. This mixture has but 35 per cent. voids.

Further experiments with aggregates led to the use of a mixture in which 55 to 70 per cent. passed a ¾-in.-mesh screen. This resulted in a coarse aggregate with but 36 per cent. voids. With the use of such gradings of coarse and fine aggregates, it was possible to transport concrete 4 to 5 miles without segregation, in a consistency up to a 6-in. slump. It was found possible to transport concrete with a consistency up to a 3-in. slump 8 to 30 miles in open bathtub bodies, without segregation. The grading of aggregates also increased the strength of the resultant concrete from 10 to 15 per cent.

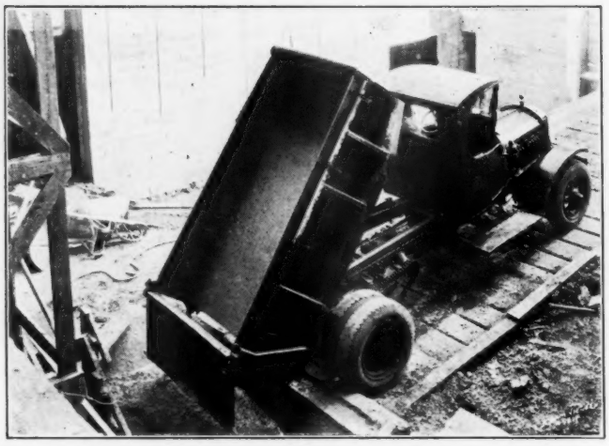
The use of properly-graded aggregates has become an important topic at the various construction and aggregate association conventions and to Mr. Donelson credit should be given for his important work along these lines.

As can be readily imagined, a plant capable of producing 1,500 cu. yd. of central-mixed concrete requires the utmost in materials-handling efficiency. This the Sloss-Sheffield company plant has.



End view of the plant showing the three concrete mixers with trucks waiting to be loaded below.

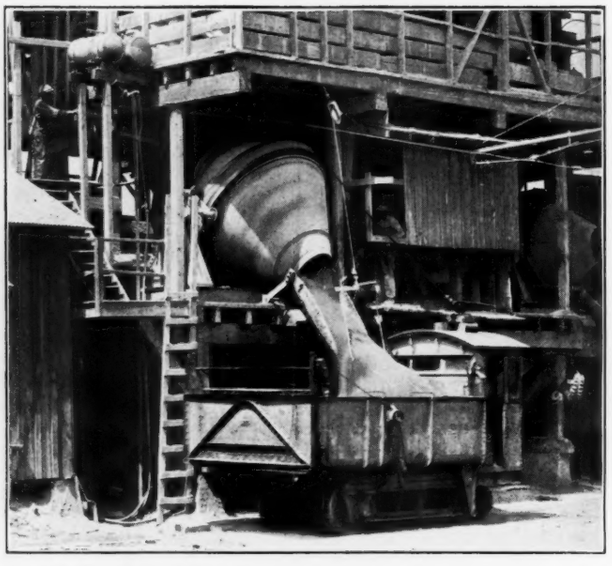
Sand and slag are sent to the mixing-plant storage bins from the slag-plant storage bins by means of a belt conveyor, which has access to six bins—three holding slag and three sand—each equipped with an adjustable gate to control the flow of the various grades of materials. The conveyor has a 22-in. belt extending for a total distance of 300 ft., 150 ft. on a horizonal plane beneath the bins, and the remainder on the mixing-plant incline. The bins above the plant store three proportions of aggregates varying from 25 per cent. "fines" and 75 per cent. coarse for Class A concrete



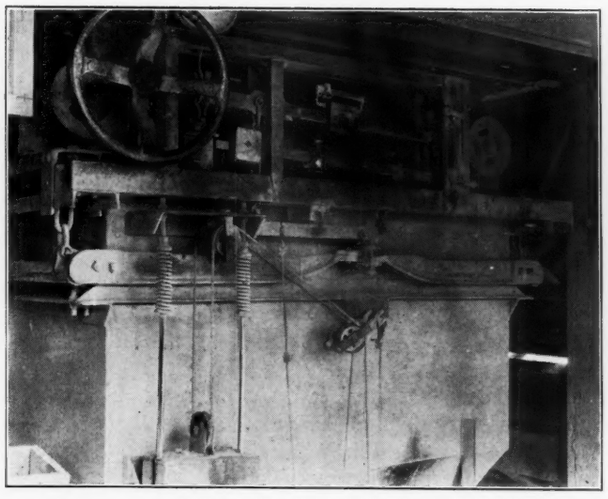
One of the open-type carriers after depositing a load at the job.

to 75 per cent. "fines" and 25 per cent. coarse for Classes B and C. There are likewise three bins of sand mixtures.

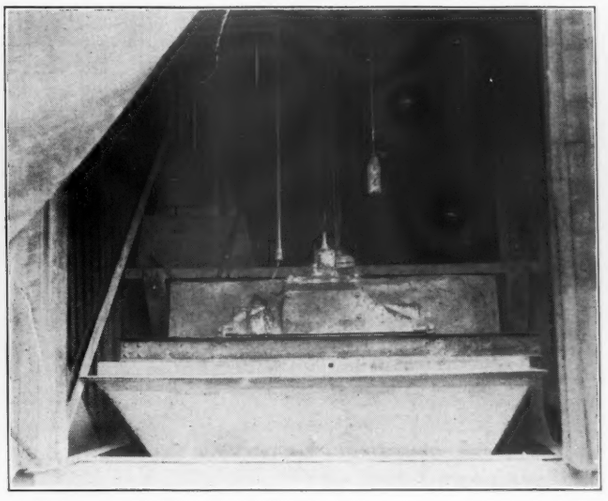
The cement-handling equipment is especially worthy of note. Originally sacked cement was used and adequate mechanical means were employed to handle the bags and the empty sacks. A vertical elevator, especially designed for cement bags, raised them to the mixing floor. Two bag-cleaners were used. For some time, however, cement has been purchased in bulk in car-load quantities.



Special end-dump car of the street railway company being loaded with concrete at one of the mixers.



Weighing hopper which measures the aggregate for the batches



Vibrating screen over cement hopper to remove lumps or foreign materials.

Briefly, the equipment involved in the handling of the bulk cement is a power shovel, a Hum-mer screen, a Fuller-Kinyon pump, and four storage tanks.

Two types of cement are in use, a puzzolan cement marketed under the trade name of Magnolia, and standard brands of Portland cement. The Magnolia brand, although a slowly-setting cement, has desirable characteristics, one being its non-staining property. Magnolia cement is commonly specified in this vicinity for base courses of concrete for asphalt pavements, sidewalks and

J. E. Donelson, manager, and August Brown.

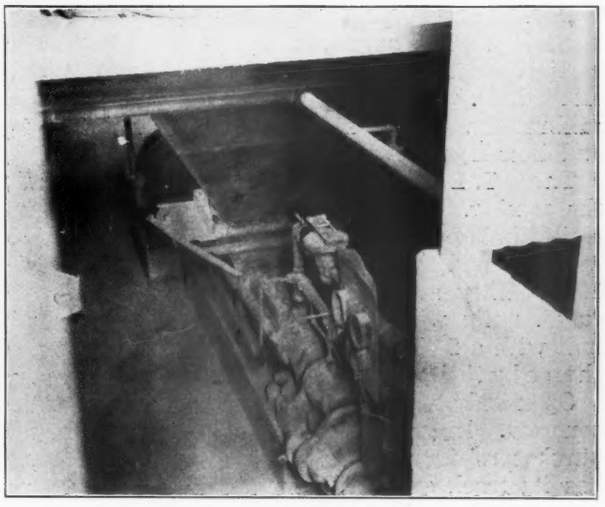
the like. Frequently mixtures of Portland and Magnolia cement are used, and all ready-mixed concrete plants in the vicinity are equipped to handle such mixtures.

Car-loads of cement are unloaded direct into an apron hopper with a power shovel which is driven by a 5-hp. motor. To prevent lumps and foreign matter from entering the cement pump, a Tyler 6-ft. by 8-ft. Hum-mer screen with a $\frac{3}{16}$-in.-mesh screen is installed in the hopper. From the screen the cement passes through a Fuller-Kinyon 5-in. pump, which is driven by a 60-hp. motor, on its way to one of the four tanks above the plant. Each tank is 12 ft. in diameter and 20 ft. in height and has a capacity of 500 bbl.

Compressed air for the Fuller-Kinyon pump is furnished by a Chicago Pneumatic Tool Co. 12-in. by 10-in. compressor driven by a Westinghouse 60-hp. motor. To insure clean air, a Reed air-filter is installed on the suction end, and for the removal of moisture, a special compression tank, filled with graded gravel, is installed in the line. Air, which enters the tank from the bottom, is forced through the gravel which causes precipitation of the moisture.

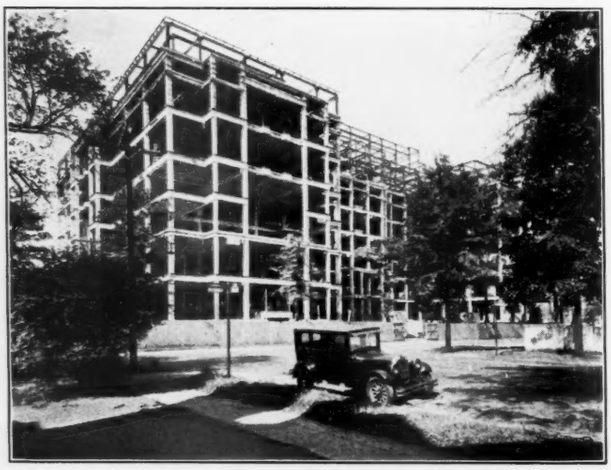
One of the money-saving devices of this plant is used in connection with the compressor. Formerly city water was employed to cool the cylinder head and the after-cooler. August Brown, the superintendent, took advantage of the prevailing shallow ground water in the vicinity and, with a small wooden sump and an air-driven Worthington piston pump, sufficient water for cooling purposes is obtained at practically no expense. This bit of ingenuity on the part of Mr. Brown saves the company not less than $50 per month.

Another unusual mechanical arrangement is the means employed to transport the two types of



Looking into sump at the pneumatic pump which handles the cement.

cement from the storage bins to the cement-weighing hoppers. Two of the mixers, both T. L. Smith 2-cu.yd. machines, use bulk cement, while the third, a 1-cu.yd. machine, uses bag cement. Each 2-cu.yd. mixer is supplied with cement from two of the four tanks. To transport the cement from the tanks to the weighing hopper, two 24-ft. screw conveyors 12-in. in diameter, are employed. One tank and conveyor supplies Portland cement, and the other tank and conveyor Magnolia cement. The two screw conveyors are driven from a lineshaft equipped with a Cutler-Hammer Magnetic clutch for each screw. At the weighing hopper a copper switch has been installed on the discharge-gate mechanism of each screw conveyor. Thus, when Portland cement is required, the proper screw-conveyor discharge gate is opened, automatically contacting the switch, the magnetic clutch in turn engaging the screw. When Magnolia cement is wanted, the operator throws a 2-way, single-pole switch which places the other magnetic clutch in the circuit. The lineshaft is driven by means of a D. O. James speed-reducer powered by a 7½-hp. motor.



Construction view of Birmingham court house which used Sloss-Sheffield concrete.

Blaw-Knox weighing hoppers weigh the concrete materials. The aggregate hoppers are of the 2-compartment type, fitted with beam scales and "tell-tale" dials. Each mixer has its own volumetric, calibrated water tank, equipped with rapid filling and discharge valves.

Three T. L. Smith Co. tilting-type mixers handle the mixing. The first 2-cu.yd. machine was installed in 1924; the second unit, a 1-cu.yd. machine, in 1926; and the last unit, a 2-cu.yd. machine, in 1929. They are all electric-motor driven, the 2-cu.yd. units with 40-hp. motors and the 1-cu.yd. unit with a 20-hp. motor. All three machines discharge by tilting direct into waiting trucks beneath.

Open-body trucks are used for the delivery of the concrete. In general, the delivery is made in the purchasers' trucks. The local street-car company has its track extended beneath the mixers, using its specially-designed electric end-dump cars for the delivery of concrete for its track construction.

Core-Drilling Reveals Deposits

(Continued from page 45)

The cost of core-drilling is affected by such a variety of conditions that any figures are likely to be misleading. There is no average cost of drilling, and there are probably no two properties where all the conditions are identical. The principal factors affecting the cost are the amount of drilling to be done, the size and depth of the holes, the accessibility of the property, the availability of a sufficient water supply, and the nature of the formations to be drilled. The cost of getting a drill and its crew to the work is the same for 100 ft. of drilling as it is for 1,000 ft.; a large core calls for heavier equipment and more rock must be ground up in the advance of the bit. Below 1,000 ft. in depth, the time spent in raising and lowering the rods becomes important, while in very shallow holes a large proportion of time may be spent in moving. Both progress and carbon wear are affected by the hardness and soundness of the rock formations. Broken or shattered rock may have to be cemented or cased off to protect the sample or to conserve the water supply.

Soft formations, such as slate, shale and clay, may be core-drilled at from $1.00 to $2.00 a foot; gypsum, talc, limestone, etc., at from $1.50 to $3.50 a foot; while granite or trap rock may cost up to $6.00. Such figures mean little when applied to some particular property, but they do indicate that core-drilling is sufficiently expensive to warrant careful consideration of the purposes for which the drilling is done and the results which may be accomplished. It is justified only when the best possible samples are secured and when these samples are made to reveal the story they can tell.

The mineral producer is often confronted with the decision between drilling under contract or purchasing and operating his own core-drill equipment. No hard-and-fast rule applies. If his holdings are sufficiently extensive to call for fairly continuous drilling over a period of years, he can probably save money by purchasing. The machines and equipment are not expensive, nor are experienced drill operators scarce. If the formations to be drilled require the use of carbon or black diamonds, he will have an appreciable amount of money invested in them, but, if carefully selected, the carbon has a high salvage value and is readily salable. Should the proposed drilling be limited in amount, or should it comprise all that is likely to be done for several years, the operator probably will gain by having his work done. In such a case, he should be sure of the reliability of the contractor.

Supplying industry with its needed materials continually is becoming a more technical problem. In the process of furnishing no inconsiderable amount of these requirements, the mineral producer is converting raw material to a finished or semi-finished state by a series of operations that require a high degree of courage, foresight, and technical ability. Exploration of his property by core-drilling or other means is one of his smaller problems, but it lays the foundation on which his whole enterprise is based.

Keeping Iron Magazines Cool Will Avoid Deterioration of Explosives

By ARTHUR LA MOTTE
Manager, Technical Section, E. I. du Pont de Nemours Co.

IN the storage of almost every material used in blasting operations, it is necessary to avoid extremes of heat and cold. As a matter of fact, it is more important to avoid extremes of heat than of cold for the reason that modern high explosives are made on formulas which will withstand almost any low temperature encountered in continental United States; but high temperatures, and especially repeated alternations of high and low temperatures such as occur in a region of hot days and cold nights, cause some dynamites to leak, which is dangerous; cause other types to set, which makes them difficult to detonate; and are likely to ruin any kind of fuse and even Cordeau. Excessive heat is also injurious to electric blasting caps. In fact, about the only explosive that does not deteriorate in hot storage is the blasting cap.

The type of magazine which most frequently causes trouble with explosives from becoming overheated is the iron magazine, because iron absorbs and holds the heat from the sun to a much greater degree than concrete or wood. There are, however, a good many iron magazines in use, and, under certain conditions, they provide the most convenient and the cheapest storage, provided they can be kept cool in hot weather.

One measure for keeping down the temperature in an iron magazine, and probably the most economical in localities where lumber and labor are cheap, is to build a wooden roof over the magazine with a foot or two of air space between it and the iron roof, or possibly to sheathe the entire magazine with wood.

Another measure which has been found extraordinarily effective for decreasing the temperature of an iron magazine is to paint it with aluminum paint. Readers may have observed that many gasoline tank-cars and gasoline storage tanks are painted with aluminum paint. This is done to reduce the loss due to evaporation. The hotter the container, the greater the evaporation; hence the need for a heat-reflecting paint. Aluminum paint, it has been found, has a higher reflecting power than any other color. Dead white comes next, while dead black has the greatest capacity for absorbing heat. When the ships of the new United States navy were first painted, white was the color selected on account of the greater comfort it gave the officers and men when cruising in hot latitudes. Unfortunately, white makes ships a more conspicuous target for the enemy and, as the naval fleet is supposed to be in fighting trim all the time, this color was eventually changed to battleship gray as having the lowest visibility. Aluminum paint, it is said, in addition to reflecting heat, has great covering power, lasts longer and maintains its fresh appearance for a longer period than almost any other light-colored paint.

Last summer a test was made of the effect of aluminum paint on the temperature of an iron magazine. Two iron magazines of the same size and construction, both painted black, were located 200 yd. from each other and subject to the same impact of the sun's rays. They are shown in Figs. 1 and 2. On July 15, temperatures were recorded at three different hours, both outside and inside one of these magazines. That evening this magazine was painted with special aluminum paint, Fig. 3, and, the following day, temperatures were taken in the same locations at the same hours. The records of these

Fig. 1.—Magazine No. 1.

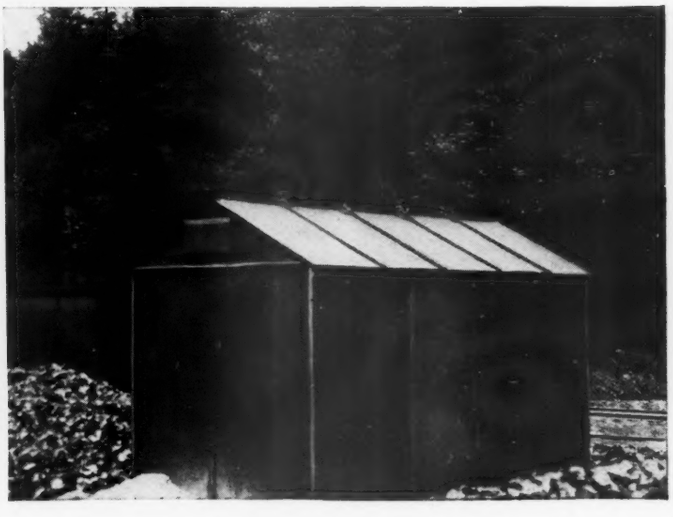


Fig. 2.—Magazine No. 2.

two days are shown in Table I which appears below.

It should be noted that, although the outside temperature on the second day was considerably higher

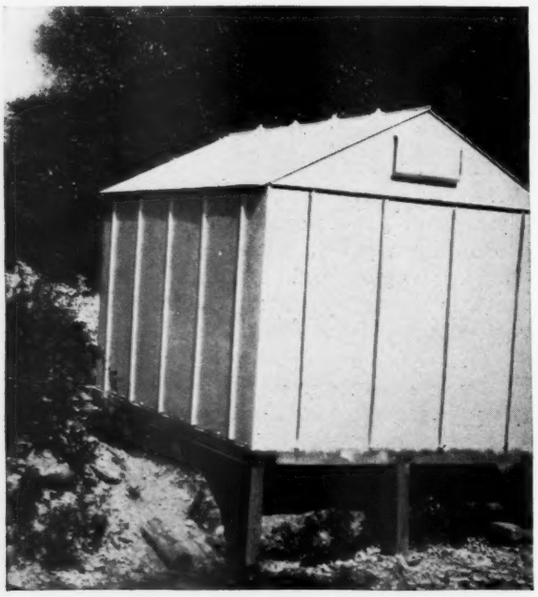


Fig. 3.—Magazine No. 1 after an application of aluminum paint.

than on the first day (10 degrees higher at 2:30 p. m.), the temperature inside the magazine on the second day was decidedly lower (12 degrees at 2:30). This reduction in temperature after the application of the aluminum paint was so striking that, on July 17, a further test was made by taking temperatures at the same hours outside and inside the

TABLE I. TEMPERATURES FOR MAGAZINE NO. 1

Time	Temperature Outside Magazine in Sunlight		Temperature Outside Magazine in Shade		Temperature Inside Magazine		Weather
	July 15	July 16	July 15	July 16	July 15 (*Black*)	July 16 (*Aluminum*)	
5:30 a. m..	....	....	68°	66°	68°	66°	Clear
2:30 p. m..	98°	108°	90°	96°	104°	92°	Clear
5:10 p. m..	96°	106°	89°	94°	103°	89°	Clear

aluminum-painted magazine and the other magazine which remained black. These temperatures are recorded in Table II.

This record of temperatures in the two magazines on the same day and under the same conditions, except for the color of the paint, affords conclusive evidence that the aluminum paint reduced the temperature inside the magazine 14 deg.

This evidence is of great interest to owners of iron magazines. It certainly points the way to a simple and practical means of keeping such magazines cool and thus preventing deterioration of dynamite and electric blasting caps with the attendant dangers of misfires and other troubles.

TABLE II. TEMPERATURES FOR MAGAZINES NOS. 1 AND 2

Time	Temperature Outside Magazine in Sunlight		Temperature Outside Magazine in Shade		Temperature Inside Magazine		Weather
July 17	No. 2 Black	No. 1 Aluminum	No. 2 Black	No. 1 Aluminum	No. 2 Black	No. 1 Aluminum	
5:30 a. m..	....	....	66°	66°	66°	66°	Clear
2:30 p. m..	108°	108°	94°	94°	108°	94°	Clear
5:10 p. m..	106°	106°	94°	94°	106°	92°	Clear

Sales of Native Rock Asphalt Drop 83,679 Tons in 1930

Sales of native-rock asphalt by producers in the United States decreased from 748,550 short tons, valued at $4,071,173, in 1929 to 664,871 tons, valued at $3,566,595, in 1930. The average value realized for each ton sold decreased from $5.44 in 1929 to $5.36 in 1930. Seven-eighths of the total tonnage of rock asphalt sold was mined in two states, Kentucky and Texas. Minor amounts were produced in Alabama, in Oklahoma, in Utah, and in California.

In Kentucky four companies mined and sold 340,346 short tons of bituminous sandstone in 1929 and 305,024 tons in 1930, a decrease of 10.4 per cent. From these sales $2,785,772 was realized in 1929 and $2,374,834 in 1930, a decrease of 14.8 per cent. Prices were lower; the average sales value dropped 5.4 per cent. (from $8.19 per short ton in 1929 to $7.79 a ton in 1930).

Four companies quarried limestone-rock asphalt in Uvalde and Kinney Counties, Texas, in 1930. Their production decreased 15.8 per cent. in quantity (from 320,931 short tons in 1929 to 270,138 tons in 1930) and 12.7 per cent. in value (from $946,003 in 1929 to $825,460 in 1930). The average sales value per short ton increased 3.7 per cent. (from $2.95 in 1929 to $3.06 in 1930).

Exports of natural-rock asphalt from the United States decreased from 46,962 short tons valued at $1,133,058 in 1929 to 23,160 tons valued at $628,673 in 1930 according to the records of the Bureau of Foreign and Domestic Commerce. The decrease was due chiefly to the drop in exports of rock asphalt to Italy, from the abnormally high figure of 14,181 short tons in 1929 to a normal amount of 550 tons in 1930. Important decreases occurred also in exports to the Irish Free State, to Canada, and to Brazil. These decreases were offset only in part by increased shipments to Mexico, to France, and to Japan.

Sales of gilsonite, mined in Uintah County, Utah, decreased 31.5 per cent. in quantity (from 54,987 short tons in 1929 to 37,684 tons in 1930); and apparently 30.2 per cent. in value (from $1,235,920 in 1929 to $863,197 in 1930). The actual sales value obtained by producers, f.o.b. mine or railroad shipping point, averaged $20.76 per short ton in 1929 and $21.58 in 1930, an increase of 3.9 per cent.

Sales of wurtzilite (elaterite) produced in Uintah County, Utah, increased from 200 tons, valued at $30,000, in 1929 to 222 tons, valued at $33,300, in 1930.

No ozokerite was produced in the United States in 1930 although 290 short tons valued at $133,408 was mined and sold in 1929. On the other hand, imports of mineral wax increased 27.4 per cent. in quantity (from 9,791,090 lb. in 1929 to 12,474,894 lb. in 1930), but only 17.2 per cent. in value (from $616,617 in 1929 to $722,426 in 1930).

Cold-Mixed-Asphalt Manufacture Offers Field for Aggregates Producers

By MARION P. WALL
Chief Engineer, Simplicity System Co.

BECAUSE state highway departments are specifying cold-mixed asphalt on extensive programs for road-building, a new field for stone quarries and gravel pits is being developed.

Cold-mixed asphalt is evolutionary. It began with the old Macadam and gravel roads which were made obsolete by the automobile. Then came the asphalt-surface-treated road, the asphalt-penetrated road, and the hot-mixed-asphalt roads, all which were attempts to meet the requirements of automobile traffic. The surface-treated roads and the asphalt-penetrated roads met with reasonable success, but were not entirely satisfactory for the reason that the grading of the mineral aggregate in the road could not be accurately determined or accurately proportioned. The hot-mixed-asphalt roads were satisfactory to some extent but, on account of the expensive asphalt-plant equipment that was required on each individual job, the cost of roads was increased so materially as to prove uneconomical. All these processes represent stages in the evolution which finally resulted in the cold-mixed-asphalt road.

Cold-mixed-asphalt roads overcome a serious objection in the other types; they present a non-skid surface which is becoming popular with the public in its effort to reduce accidents and the loss of life that comes from constantly increasing automobile traffic.

There are several methods of building cold-mix-asphalt roads or, rather, of preparing and amalgamating the mineral aggregate and the asphalt binders. All these processes have one aim: to prepare an asphalt mixture that will remain workable until it is laid on the road and subjected to traffic, and that will harden through exposure to the atmosphere.

The Liquefier Process

One process involves adding a liquefier. This may be naphtha, or any other solvent that gives the asphalt binder a liquid consistency but which, when exposed to the atmosphere and traffic, will disappear and leave the binder of the same consistency it would have in a hot-mix-asphalt road, wherein it is rendered liquid by heat and maintained at a high temperature until laid. The result is eventually the same for the cold mix as for the older hot mix. A brief outline of the specifications for this process, quoting from the New York Highway Department, is as follows:

(A) The aggregate must be bone dry and have a temperature approximating 85 deg. F. This requires a drying and a cooling process.

(B) The aggregate requires two distinct gradings: one for the bottom course, the other for the top course or wearing surface. In the bottom course the aggregate is graded from 2¼-in. to 1¼-in. In the top course or finished wearing surface, the aggregate is graded from 1¼-in. to ⅛-in. This requires special screening facilities for the reason that the grading is a very important factor in the success of the road.

(C) The aggregate, after screening, is deposited in separate bin compartments for the different grades. From these compartments the graded aggregates are drawn into a weigh box and proportioned by weight. This weigh-box is supported on either multi-beam or dial scales and the weights are accurately determined.

(D) The combined aggregates, accurately proportioned, are dumped into a twin pug-mixer.

(E) The liquefier is added in the mixer to keep the material in workable condition during its transportation by railroad and truck or, should it be necessary, during storage on the line of the work.

(F) The asphalt-cement binder is then added and the combination thoroughly mixed.

(G) The mixing time specified in the New York specification is 4 min. Prior to the completion of mixing, hydrated lime and limestone screenings are added. The liquefier, the hydrated lime, and the screenings tend to keep the mixture in workable shape.

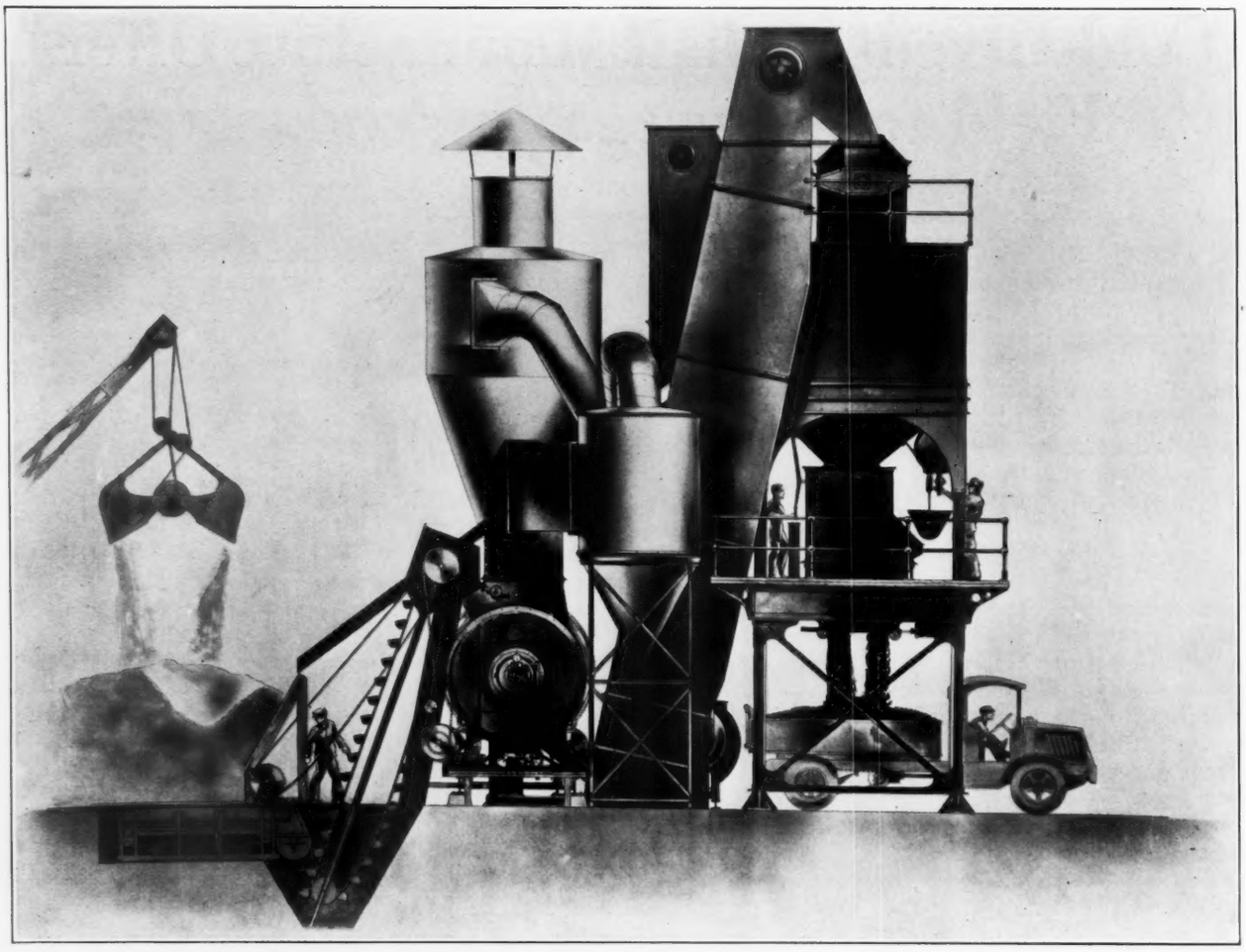
(H) The mixture is then ready for transportation to the road site. The methods of spreading are no different from the methods pursued in laying a hot-mix-asphalt road, except that highway departments are becoming more particular about perfect riding surfaces.

In making Macasphalt the producer uses a hard natural asphalt that comes from an island in the West Indies. This material is so hard that it can be pulverized in the ordinary hammer-mill to an almost impalpable powder. The producer first adds to the aggregate a standard asphalt-cement binder of high penetration—almost a liquid. Following this he adds a percentage of the powdered natural asphalt. The asphalt binder does not attain its cementing consistency until the light liquid asphalt cement amalgamates with the hard asphalt on exposure to atmospheric conditions and the kneading effect caused by traffic. The result is the same as that obtained with an asphalt of, say, 50-60 penetration asphalt cement in a hot mix.

One advantage peculiar to this process is the fact that waste materials, such as screenings, sand and pea-sized gravel, can be handled, whereas perhaps it would be impractical to attempt to handle them by the liquefier process.

The Colprovia Process

In the Colprovia process the retardation is obtained by the use of oil asphalt that is brought to



Plant elevation showing the feeder, cold elevator, drier and dust collector.

hardness by carrying the process of distillation to a point at which the asphalt is oxidized. This product is ground to an impalpable powder and is then added to the aggregate with a soft asphalt cement binder, having almost the consistency of a liquid. It also does not reach the consistency that an asphalt-cement binder should reach until it is subjected to atmospheric conditions and the kneading effect of traffic.

It is claimed for these two processes that they provide a much more closely graded mixture than can be obtained by the liquefying process. In either process the mechanical appliances are practically the same. In the case of Macasphalt, the mixture can be made at a temperature approaching that of a hot mix and still be kept workable, because the flow-point of the hard, natural asphalt is so high that it does not harden until after the amalgamation with the semi-liquid asphalt cement.

Each installation of a cold-mix plant requires special consideration and engineering to fit the conditions of existing quarry operations. Unquestionably, civil and chemical engineers will agree that, for cold-mixed roads, the material must remain workable for a long time and have a dense grading of the aggregate.

One contractor, in 1930, produced 187,000 tons of cold-mixed asphalt in New York State and Canada. Another quarryman operates a plant with a capacity of 1,000 tons per day and expects to have a second plant of equal capacity in operation during 1931, showing the magnitude of the business and the interest that has been aroused.

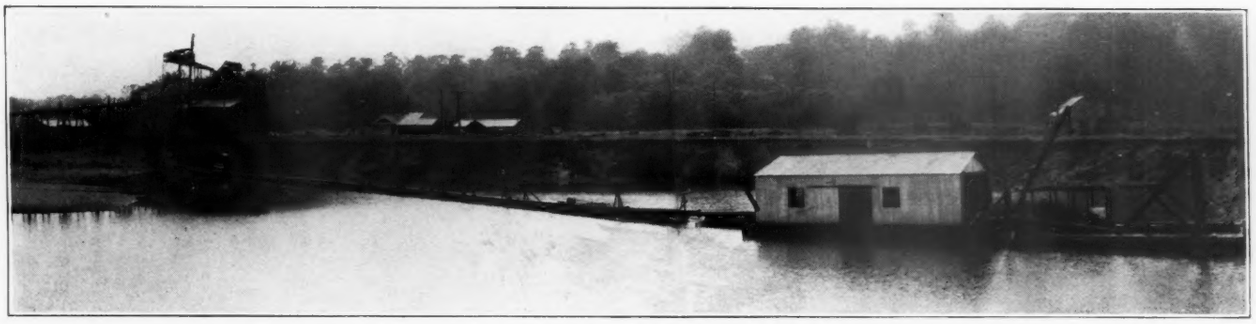
The accompanying illustration shows equipment used in preparing cold-mixed road materials, for truck delivery only.

Rock Salt Mined in United States in 1930 Totals 1,977,370 Tons

The salt manufactured and sold in the United States in 1930 amounted to 8,054,440 short tons valued at $25,009,480, according to reports of the producers to the United States Bureau of Mines, Department of Commerce. These figures show a decrease of 6 per cent. in quantity and 8.5 per cent. in value from the sales for 1929, which were 8,543,560 short tons valued at $27,334,695.

Rock salt, which represented about 25 per cent. of the salt produced in 1930, amounted to 1,977,370 short tons valued at $6,391,775, a decrease of 6 per cent. in quantity and 10 per cent. in value from the output of 2,113,010 tons valued at $7,127,681 reported in 1929.

Michigan, New York, Ohio, Kansas, Louisiana, and California, in the order named, are the largest producers of salt.



Plant and service buildings at left; pipe-line and dredge in foreground.

Well-Designed Dredge Placed in Service by Indiana Gravel Producer

Opening Up of New Raw-Material Supply Compels Abandonment of Dry Excavating

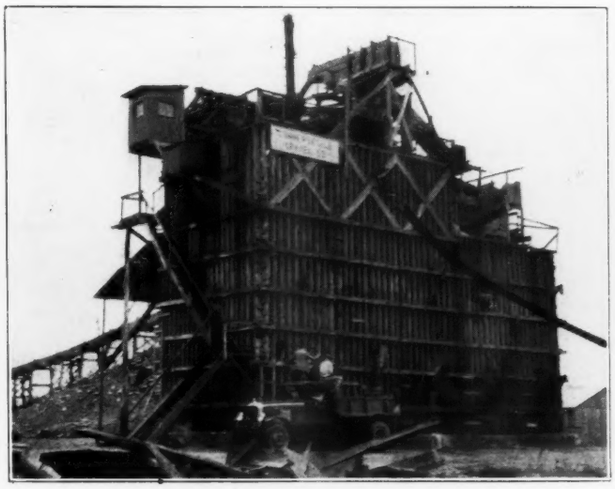
A FINE example of dredge design can be found at Connersville, Ind. Built as three sections of steel pontoons, and housed with a corrugated-iron sheeting, this dredge has proved serviceable yet economical.

The owner, the Connersville Gravel Co. of Connersville, Ind., is well known among aggregate producers of Indiana. Its secretary-treasurer, Clyde Piper, has long been identified with the gravel industry of his state and is active in the Indiana Sand & Gravel Assn.

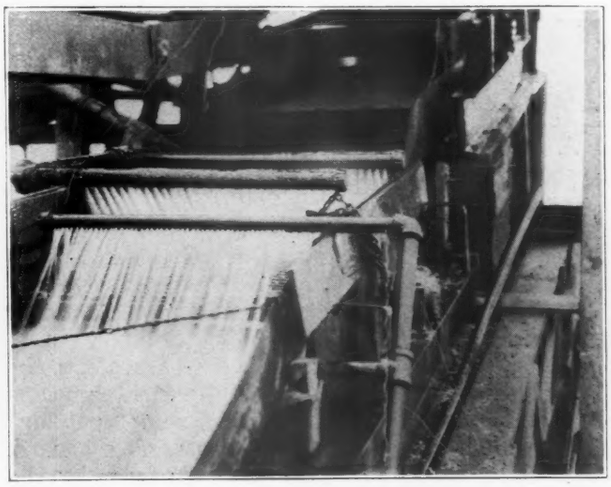
Originally, production of raw materials was made through the use of a slack-line cableway and, for three and one-half years, this method was used successfully. Conditions in the pit, however, led to the retirement of this method. A new section of ground, at a considerably greater distance from the plant, was found to contain material more suitable for dredge reclamation and, accordingly, a dredge sufficiently large to increase the former production rate was built and installed.

The dredge hull, as assembled, is 24-ft. wide, 48-ft. long and 4-ft. deep. Two parallel pontoons, which extend forward 35 ft. to support the cutting-chain mechanism and its A-frame, are hinged to the dredge hull. The hull was built by the American Steel Dredge Co.

A 12-in. centrifugal sand pump made by the Hetherington & Berner Co., Inc., of Indianapolis, Ind., with a Diamond cutting chain, (a W. H. K. Bennett Co., Chicago, Ill., product) are the chief items of mechanical equipment. The pump, centrally located, is mounted on a heavy cast-iron subbase and is direct-driven by a Fairbanks-Morse 300-hp. motor. No extreme curves or bends are placed in the suction piping, and in the discharge only one long-sweep L is used. The Diamond cutting chain is 25 ft. in length and is driven by a 15-hp. motor through an open-gear drive. Its hoisting machinery consists of a National Hoisting Engine Co. 3-drum unit powered by a 20-hp. motor. An additional A-frame, anchored to the dredge hull,

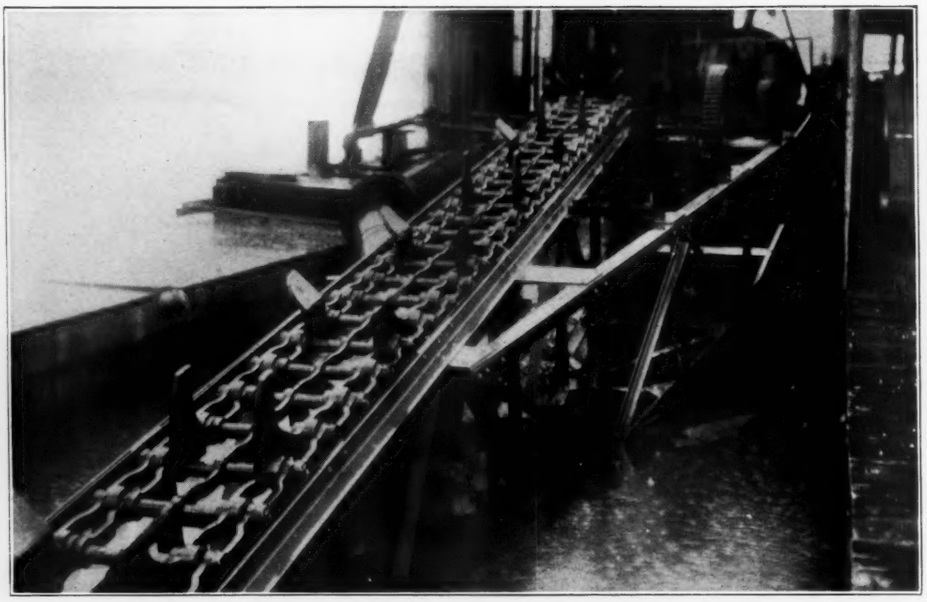


State highway truck being loaded at bins.



Washing nozzles at the vibrating screens.

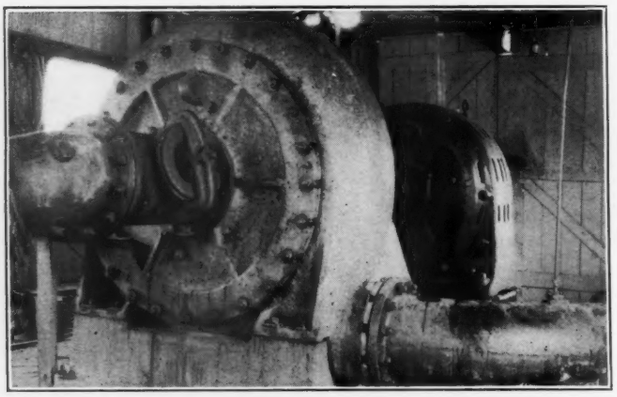
Clyde Piper, secretary-treasurer.



The cutting-chain equipment on the dredge.

leans forward over the cutting-chain pontoons, in order to clear the wire rope from the drive mechanism of the hoisting machinery.

The auxiliary equipment of the dredge includes a Dean-Hill 4-in. by 3-in. centrifugal pump for supplying water to the hydraulicking nozzle which is mounted at the forward end of the pontoon; and a 2½-in. by 2-in. centrifugal pump with a No. 7



The 12-in. pump and motor aboard the dredge.

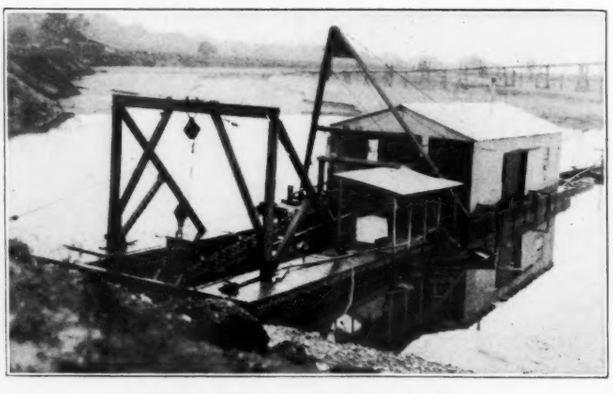
Penberthy ejector that is used for priming the 12-in. sand pump.

A submarine-type cable extends from the shore to the dredge for transmitting the electric power to the pump motor and other equipment. This cable consists of a 3-wire core, heavily insulated and protected by a lead sheathing. Outside the latter, the entire cable is wrapped in a heavy hemp covering. The use of such cable is a marked improvement over the former practice of extending ordinary wires over haphazardly-constructed crossbars along the discharge-pipeline pontoons. While the submarine cable is actually supported by the same pontoons, it is permanently safe, can never present a hazard, and will never break or short. It is made by the Safety Cable Co., Bayonne, N. J.

The tipple of the Connersville Gravel Co. is of the usual design, consisting of storage bins above which the processing equipment is located. The dredge discharge pipeline extends a total distance of 560 ft. to a double-pass box mounted at the very top of the tipple. Here the velocity of the sludge is reduced and the material is sent to the first of two Simplicity vibrating screens. The first screen unit acts as a divider and sends the sand from its lower deck to the Telsmith No. 7 sand-settling tank. Its top deck, a ¾-in.-mesh screen, acts as a scalper, sending the plus ¾-in. gravel to the top deck of the second vibrating screen. Oversize material—3/16-in. to ¾-in.—from the sand screen is sent to the second deck of the classifying screen. The second vibrating screen consists of three decks with meshes of 1¼-in., ½-in. and ¼-in. respectively. All material above 1¼-in. is sent to a Universal 8-in. by 24-in. jaw crusher driven by a 25-hp. motor. Two sizes of gravel and two sizes of sand are stored.

Wash-water for the screens is supplied from a Dean-Hill 6-in. centrifugal pump, driven by a 40-hp. motor. This pump is primed by a Connersville Blower Co. No. 12 priming pump.

(*Continued on page 69*)



View at front end of the dredge.

Financial Survey Points to Overbuilt Condition in Cement Industry

THE weaknesses of the cement situation, particularly as regards low prices, over-production and over-expansion, have earned the attention of many outside the industry, such as traders and investors in cement-company securities. It is unlikely that an industry in which these conditions are so pronounced could escape outside scrutiny and comment, and it is fortunate for the industry that most of this comment has been free from the exaggeration and misinformation that characterize the usual outsider's view.

The National City Bank of New York, in a recent issue of its economic bulletin, published an enlightening financial survey of the Portland-cement industry. This survey gives a dispassionate account of the causes for the profitless operation of cement plants in general and makes some suggestions as to the manner in which this condition could be relieved. The present low ratio of production to capacity, and the prevailing low market prices are due, in part, to foreign competition but chiefly to over-expansion in the industry, according to the survey. The situation is described in the following words:

"Although the immediate cause of the decline in corporation profits last year was the reduced volume of general business and falling prices, a more fundamental difficulty besetting many industries is the excessive investment of new capital for the expansion of productive capacity during recent years. Of this, the cement industry affords an example. Here is an industry that, for many years, had enjoyed an almost uninterrupted growth and whose product is used in a countless variety of ways.

"Last year the Portland Cement Association estimated that approximately 32 per cent of all cement was used in concrete roads, streets and alleys, and 25 per cent for structural concrete in commercial, industrial, public and private buildings, the remainder being distributed in sewerage, drainage, irrigation and water-power projects, bridges, railways, rural uses and masonry blocks. The tall skyscrapers, huge dams and other spectacular projects account for a surprisingly small portion of the total consumption of cement, the bulk of the demand coming from the more commonplace building groups.

"During 1930, the nation's road-building program was carried forward with increased effort because of its effect in enlarging employment, the state of Iowa leading all others with the construction of more than 1,000 miles of paved highways. Not all the money spent for materials is for cement, however, a large part going for sand, gravel and stone, while the cost of labor for excavating, grading and laying pavement is usually fully as much as for materials, so that the purchase of cement constitutes only 10 to 15 per cent of the total expenditure. In the construction of steel-frame buildings, a considerable amount of concrete is used, as well as brick and stone, but it usually contains a larger part of cinder or other aggregate and a much smaller amount of cement in relation to its size or cost, than a single family residence. For every large building constructed, there are literally hundreds of private dwellings, each requiring 50 to 100 bbl. of cement for its foundation, cellar, sidewalks, driveways and perhaps stucco exterior.

"While there was a decline last year in new building construction amounting to more than 21 per cent, according to the F. W. Dodge Corp. figures, there was an increase of nearly 15 per cent in contracts awarded for public works and utilities, the most important item of which is highways. There was a decrease of but 6 per cent in shipments of cement, hence it might possibly have been supposed that the industry was having a highly prosperous year.

"As a matter of fact, this was not the case. Annual reports that have recently been issued by thirteen representative domestic manufacturers of cement show that net profits, after all charges but before dividends, were about 10 per cent lower in 1930 than in 1929, and while this, in itself, is not a large decline measured against the decreases shown in many other industries, it follows a decrease of 32 per cent in 1929 from 1928 when industry generally was enjoying a big increase. The rate of profits return on capital and surplus showed a marked decline, as may be seen from the following summary of the statements of the group:

Thirteen Domestic Cement Manufacturers
(In thousands of dollars)

	1928	1929	1930
Capital and surplus, Jan. 1	$172,178	$173,323	$177,825
Net profits for year	14,271	9,732	8,762
Profits return on capital and surplus	8.3%	5.6%	4.9%

"A decrease in last year's earnings as compared with 1929 was reported by the majority of companies, although four were able to show gains. Figures of the Universal Atlas Cement Co., the largest producer, are not included, for the reason that it is a subsidiary of the United States Steel Corp. and does not publish a separate statement.

"The explanation of the declining trend of earnings is to be found in the excessive expansion of manufacturing capacity during the past few years. Growth of the domestic industry has been almost phenomenal as may be seen from the following table showing plant capacity and production by ten-year intervals up to 1920 and by single years up to 1930. Ratio of finished cement produced to manufacturing capacity is also given so as to show the decreasing percentage of capacity utilized in recent years.

Cement Production and Capacity
(In thousands of barrels)

Year	Estimated Capacity	No. of Plants	Annual Production	Pct. Production of Capacity
1880	(*)	(*)	42	(*)
1890	(*)	16	335	(*)
1900	(*)	50	8,482	(*)
1910	97,670	111	76,550	78.3
1920	146,400	117	100,023	68.3
1921	144,354	115	98,842	68.5
1922	146,203	118	114,790	78.5
1923	161,858	126	137,460	84.9
1924	175,100	132	149,358	85.3
1925	193,558	138	161,659	83.5
1926	215,300	140	164,530	76.4
1927	227,080	153	173,207	76.2
1928	243,702	156	176,299	72.3
1929	259,344	163	170,646	65.7
1930	260,000**	165	160,905	61.8

* Not computed.
** Partly estimated.

"Between 1920 and 1925, plant capacity was enlarged by 34 per cent and production increased 62 per cent, thereby raising the ratio of operations from 68.3 to 83.5 per cent of capacity. Evidently the favorable conditions of these years encouraged investment unwarranted by demand for, in the next five years, plant capacity was enlarged by 34 per cent while production decreased slightly, thus lowering the operating ratio to 61.8 per cent of capacity, which is the lowest ever registered since the computation of the figures began in 1907, save in 1918-1919 when building construction was at a standstill due to the war and tight money market conditions.

"Accompanying the marked increase in capacity since 1920, there was a steady decline in prices, and present average factory price for all plants in the country is the lowest in many years. In some sections of the country the situation is worse than others. In the Mountain and Pacific states, the shipments of cement last year represented less than 50 per cent of plant capacity. Even in the Middle Western states, where percentage of idle capacity was the lowest of any district, the keen competitive conditions that prevail illustrate how a relatively small over-production by a few companies can break the price structure to the detriment of the entire industry.

"Importation of foreign cement has further aggravated the competitive situation existing in the domestic markets, particularly in the cities located on or near the Atlantic Seaboard. A duty of 6 cents per 100 lb., or 23 cents per bbl., was included in the 1930 tariff law, but apparently has been insufficient to protect American producers against the importations of foreign cement, which still continue although in smaller volume. Because of the manner in which foreign cement is sold, it has a disrupting influence upon prices far out of proportion to its actual amount.

"As a result of these conditions, the securities of most of the representative cement companies are at present selling at a substantial discount below their book values in spite of the comfortable financial position shown by their latest statements.

"Whenever the cement industry, or any other industry, becomes over-developed, the only remedy is to suspend further expansion until such time as demand again assumes a proper relation to capacity. No one can say precisely what this relationship should be, for every industry needs to carry a certain amount of surplus capacity to meet peak seasonal requirements, to allow for repairs to machinery and to provide for the continual shifting in demand among different sections of the country. Healthy competition stimulates efficiency and economy in operations and tends to lower costs. Addition of too much new capital, however, must inevitably be followed by a reaction that has a disastrous result to all concerned—not only to the companies already established, but to the investors, to labor, to allied industries that are founded to supply the imaginary demand, and to the communities themselves, because the projects are fundamentally unsound in principle."

Well-Designed Dredge in Service

(Continued from page 58)

General Electric motors and Cincinnati Rubber Co. suction and discharge piping connections are standard throughout the plant.

The normal capacity of the plant averages between 800 and 900 cu. yd. per day. At the present time, the pit operations have extended over an area of 9 acres. The company has a total working area of 59 acres, held under a lease.

Consumption of Explosives in March Reported by Mines Bureau

The quantity of explosives manufactured in the United States and sold in March, 1931, for domestic consumption was 261,200 kegs (6,530,000 lb.) of black blasting powder, 3,508,000 lb. of permissible explosives, and 19,569,000 lb. of high explosives other than permissibles.

These figures are based on reports received by the U. S. Bureau of Mines from nearly all manufacturing companies, and include an estimate of sales by several companies that do not furnish monthly reports. Reports actually received from manufacturers showed sales of 259,655 kegs of black blasting powder (consisting of 151,590 kegs of granular powder and 108,065 kegs of pellet powder), 3,419,059 lb. of permissible explosives, and 18,344,891 lb. of high explosives other than permissibles. Sales in March, 1931, were 4 per cent. greater than in March, 1930, for black blasting powder, but 9 per cent. less for permissibles, and 24 per cent. less for high explosives other than permissibles. Sales in March, 1931, when compared with sales in February, 1931, showed a decrease of 4 per cent. for black blasting powder, but increases of 2 per cent. for permissibles, and 9 per cent. for high explosives.

Sales of black blasting powder in March, 1931, by companies reporting to the Bureau of Mines were 9,500 kegs greater than in March last year, although smaller amounts were used for metal mining, quarrying, and non-metallic mineral mining and for miscellaneous purposes.

South American Plant Produces Gypsum at Average Cost of $2.43 per Ton*

Operation at 13,125-Foot Altitude in Bolivia Said to Be Highest in World

By ERNST MEYHOEFFER

Bolivia, the heart of South America, possesses in addition to the world's highest capital city, LaPaz, a great number of "highest" institutions, for the greater part of this country lies at the same height as the famous Mont Blanc. LaPaz itself, picturesquely nestled in a valley basin 3,700 m. (12,140 ft.) above sea level is still comparatively low, for the gypsum plant I am going to describe, and especially the many zinc mines, lie for the most part more than 4,000 m. (13,125 ft.) above the sea. The limit of perpetual snow, however, lies in this land of sunshine at about 4,500 m. (14,765 ft.).

The use of gypsum in construction works is found ever since the Spaniards conquered Peru; the Incas were not acquainted with the use of this binding material. Several centuries have passed since the conquest, but the manufacture of gypsum remained conservative through the whole time; for grinding, for instance, there were still in use the old *cimbaletes,* heavy semi-circular stones that two men rock to grind the burned gypsum. Then by a sieving of one sort or another they obtained a more or less fine powder. The burning was done exclusively in round kilns or ovens; the fuel was dry llama dung, called *taquia.* The product was a gypsum easy to spread, but, because of the coarse particles, it could be used for only a few fine works. To keep the surfaces from cracking, ashes were mixed with the gypsum. The setting time varied. But with centuries of familiarity with this kind of gypsum the mason became very well accustomed to it and its use for ordinary structures reached a quite enormous figure. The houses, which in the upper stories are always walled up with mud, were coated inside and out with gypsum plaster. Roofs are always, and often floors as well, of gypsum. With such a large consumption and the abundant occurrences of gypsum rock, there arose a great number of gypsum works, and, in consequence of this, the price sank so that no great riches were to be won from its production.

For several years the writer managed the largest operation of this sort, which even then had a ball-mill available for grinding the burned stone. It was the incidental operation of a large estate near LaPaz. This ancient operation, however, was so uneconomical that it was decided to build an up-to-date plant.

The new gypsum plant, which has been in operation since October, 1929, was built according to the plans of the Firma Gebr. Pfeiffer. It is 15 km. (9.32 mi.) south of LaPaz, along a peak at an elevation of some 4,200 m. (13,780 ft.). Its low production costs are due in part to its thoroughly modern mechanical equipment, and in part to the bounty of nature, for both gypsum and fuel are found in close proximity on the property. The hill by which the plant stands is pure rock gypsum, and at the foot of the hill are peat-mosses which can supply sufficient fuel for many centuries. Further natural advantages are the slight distance from the plant to the center of its use, and the possibility of driving the machines with water power; but, in addition to this, the high-tension current line of several tin mines passes close by the plant. Since the current charge is low and the power requirement is slight (7 kw. per metric ton, or 2,205 lb.), the construction of water-power facilities would offer no advantages, and the plant operates on purchased current.

The stone is blasted with dynamite, and is conveyed out of the quarry on a track 60 m. (196 ft.) long to an elevated crusher. The crusher discharges into a bin, from which the material is withdrawn by a table feeder and delivered to an elevator by which it is passed over a large screen, either to the hammer-mill or direct to the air-separator. The "fines" from the air-separator pass into the dust bin, the coarse back to the mill and from the mill, along with fresh material, into the elevator.

This grinding unit delivers 20 metric tons (22 short tons) in 10 hr., in dry stone, or even more; on account of the compact arrangement of the machines only one workman is required. The raw-dust bin discharges into the kettle of 1-ton (2,204-lb.) capacity. The duration of firing, using peat fuel, is about 1 hr. Only one man is required for its attendance. Under the kettle are industrial cars for removal of the ashes. Below the cooling bin is equipment for automatic sacking, which for 10 metric tons (11 short tons) of material requires only several hours per shift, so that the packer has time for other jobs, such as removal of the ashes, etc. Instead of 32 men, whom we employed in the old installation, three men are now sufficient per shift.

It is of interest that the gypsum, even at 135 deg. F., yields a slow-setting plaster. Temperatures of 125 to 128 deg. F. are sufficient for the production of quick-setting plasters for modeling and dental purposes, but some skill must be applied in this process because the charge of the kettle only begins really to boil at 120 deg. F.

It is probable, too, that the world's highest gypsum plant has the lowest production costs in the world at the present time. In the costs per 100 kg. of packed plaster, which I have listed below according to months, are included: costs for winning

* Translated from *Tonindustrie-Zeitung,* 55:262-3, March 2, 1931.

the stone, including blasting and amortization of the equipment; all wages and salaries; electric power, winning the fuel, including transportation to the plant; amortization of all plant equipment; and lubricants. In the eleven months of operation there have been no expenses for repairs; not even the hammers of the hammer-mill have been changed, and the jaws of the primary crusher should last certainly five years.

These costs, per 100 kg. (220.5 lb.) of packed plaster, are:

November, 1929	82 centavos	(32.8c.)
December	76 centavos	(30.4c.)
January, 1930	65 centavos	(26.0c.)
February	61 centavos	(24.4c.)
March	58 centavos	(23.2c.)
April	60 centavos	(24.0c.)
May	62 centavos	(24.8c.)
Average	67 centavos	(26.8c.)

In earlier descriptions of foreign gypsum plants I have regretted the absence of any reference to costs. From rough calculations, however, I believe that not even the gigantic gypsum works of Australia have the low costs of this little plant, from which it is to be concluded that, with good mechanical equipment and with the elimination of that usual failing of small operations (that is, running empty, the cause of which is often poor equipment), the production costs need not be any greater.

Concrete-Mixing Plants in New York Employ 31 Delivery Trucks

ESSENTIALLY a large-tonnage, small-margin industry, the ready-mixed-concrete business depends for success largely upon the facility, speed, efficiency and economy with which materials can be handled. Sand, gravel, stone and cement, as well as the finished mix, present a problem in this regard that has challenged the most progressive thought in the field.

The degree to which these problems have been solved proves the industry is well beyond the experimental stage and is already a stabilized member of the great industry of building. The number and capacity of ready-mixed-concrete plants have been doubled and tripled within a surprisingly short time, growing even in the face of adverse business conditions.

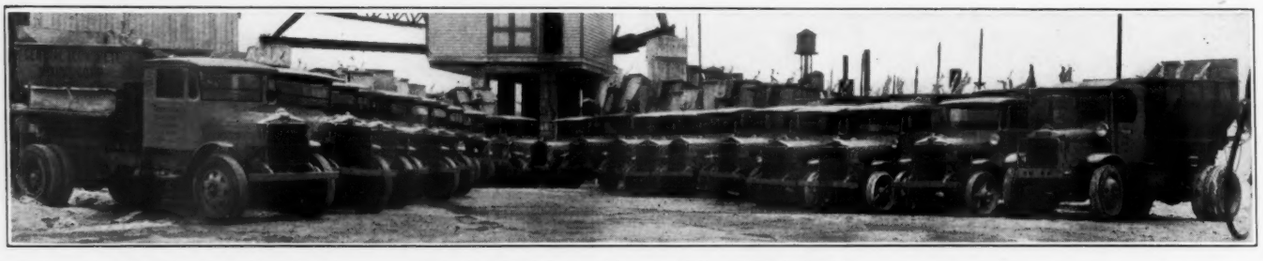
One of the largest concrete plants operating in the Metropolitan area of New York is that of the Central Concrete Mixing Corp., in Brooklyn, operated by Audley Clarke, president, and Al Johnson, manager and engineer. The Smith Street plant, No. 1, which is primarily for pre-mixed concrete, has a capacity of 1,000 cu. yd. per day. The bulk dry cement comes in on a special railroad float accommodating eight patented cement freight cars. The float is unloaded by a Diesel engine located in the hold, which pumps the cement out of the cars, when it is carried by a Fuller-Kinyon pumping system through about 250 ft. of underground pipe and up into three funnel-shaped storage bins, 75 ft. in the air. These three bins have a total capacity of 4,500 bbl. An operating bin, located directly over the mixing chamber, is filled from the storage bins by a screw conveyor and bucket elevator. A 4-compartment, 300-cu. yd. bin for storing the aggregate (sand, gravel, and two kinds of stone), is also located over the mixing chamber and is kept full by a crane with a 2-cu. yd. bucket.

The engineer in the batching chamber, who knows the type of mixture desired and the formula, operates the proper levers and valves, which automatically measure the required amount of sand, stone, gravel, cement into a hopper. The material then goes into a 3-cu. yd. mixer where water is added. After a minute and a half of mixing, the mixer tilts and loads the truck.

Plant No. 2, operating at Morgan Ave. and Varick St., is similar to plant 1, except that provision is here made for loading the truck with dry mix as well as pre-mixed concrete.

Mr. Clarke lays special emphasis upon his transportation equipment, believing the success of the entire business depends upon delivering concrete on time and in the best possible condition ready for instant pouring. The trucks must always be in perfect condition and absolutely dependable at all times. Size, capacity, type of body, all must be right for each job, to keep costs low.

Each truck has its type of work to do. Of the total fleet of 31 Sterling trucks, 10 are equipped with Blaw-Knox 5-cu. yd. dump-type mixer bodies with arm agitators; 10 are supplied with the 3-cu. yd. Blaw-Knox mixer bodies with high lift and with arm agitators operating from a power take-off. Each of the remaining 11 trucks is equipped with a Jaeger cylinder-type mixer body operated by an extra Hercules engine mounted between the body and the cab. The arm-agitator type of body is used especially on short hauls, when it is necessary merely to keep the wet mixture stirred up to avoid settling. The revolving cylinder body is especially profitable on long hauls, when it is loaded with dry materials which are mixed after arrival at their destination.



A fleet of nineteen trucks at the New York plant.

MEN OF THE INDUSTRY

The portrait printed on this page in each number of PIT AND QUARRY is selected without significance as to current events or the position of the individual in the industry.

© Blank-Stoller, Inc.

A. H. BANNISTER
Country-Sales Manager
Moulding-Brownell Corp.
Chicago, Ill.

Coming Events

June 3-4, 1931, White Sulphur Springs, W. Va. Thirteenth annual convention, National Lime Assn., New Greenbrier Hotel. N. G. Hough, president and general manager, 927 15th St., N. W., Washington, D. C.

June 8-12, 1931. White Sulphur Springs, W. Va. Annual convention National Fertilizer Assn., New Greenbrier Hotel. Charles J. Brand, executive secretary and treasurer, 616 Investment Bldg., Washington, D. C.

June 10, 1931. Buffalo, N. Y. Midyear meeting, Gypsum Assn., Statler Hotel. Henry J. Schweim, chief engineer, 211 W. Wacker Drive, Chicago, Ill.

June 11, 1931. St. Louis, Mo. Monthly meeting, St. Louis Quarrymen's Assn., Forest Park Hotel. E. J. McMahon, exec. sec., 4063 Forest Park Blvd., St. Louis, Mo.

June 15-18, 1931. Pittsburgh, Pa. International Cost Conference, National Assn. of Cost Accountants, William Penn Hotel. Stuart C. McLeod, secretary, New York, N. Y.

June 22-26, 1931, Chicago, Ill. Thirty-fourth annual meeting, American Society for Testing Materials. Stevens Hotel. R. E. Hess, asst. secy., 1315 Spruce St., Philadelphia, Pa.

October 12-16, 1931. Chicago, Ill. National Safety Congress. W. H. Cameron, secretary, National Safety Council, 20 N. Wacker Drive, Chicago, Ill.

Jan. 25-26, 1932. Pittsburgh, Pa. Annual convention, National Ready-Mixed Concrete Assn., Wm. Penn Hotel. V. P. Ahearn, executive secretary, Munsey Bldg., Washington, D. C.

Jan. 27-29, 1932. Pittsburgh, Pa. Annual convention, National Sand & Gravel Assn., Wm. Penn Hotel. V. P. Ahearn, secretary, Munsey Bldg., Washington, D. C.

Feb. 3-4, 1932. Washington, D. C. Annual meeting, Sand-Lime Brick Assn. Ellen Knight, sec., 321 N. Hamilton St., Saginaw, Mich.

Feb. 23-26, 1932. Washington, D. C. Annual convention, American Concrete Institute, Wardman Park Hotel. Harvey Whipple, sec., 2970 West Grand Blvd., Detroit, Mich.

Pumpings from the Old Pit

Excerpts from the old files of PIT AND QUARRY *reveal many interesting sidelights on the activities of the pits, quarries and plants of former days. These are printed in this column each issue.*

Fourteen Years Ago

THE Hersey Gravel Co. was organized at Evart, Mich., with a paid-in capital of $27,000. Incorporators of the concern were William Reardon, president, Midland, Mich.; V. R. Davy, Evart, secretary-treasurer; G. A. Glerum, Evart; and W. H. Allswede, Sanford, Mich. A 200-acre sand-and-gravel deposit was acquired by the company at Hersey, Mich.

* * *

Whitney Brothers of Duluth, Minn., announced plans for the construction of a 500-ft. pier in Lake Superior for the handling of sand and gravel produced from the bed of the lake. Crushing, grinding and screening equipment were to be installed on the pier, with a conveyor system running its entire length to transport the finished materials to the shore for loading into cars.

* * *

Ten Years Ago

THE annual convention of the National Lime Assn. was to be held June 15, 16 and 17, 1921, at the Hotel Commodore, New York, N. Y. Charles Warner was president.

Shareholders of the Riverside Portland Cement Co., Los Angeles, Cal., were agreeably surprised when they received their quarterly dividend checks to discover an announcement that the direction of the company had declared a 100-per cent. stock dividend.

* * *

Notable developments in the potash and lime industry were reviewed in a comprehensive article by R. Norris Shreve, chemical director of the Eastern Potash Corp.

* * *

Five Years Ago

UNDER the heading, "A Hundred Years in the Lime Industry," F. A. Westbrook discussed and described the operations at the Redding, Conn., plant of the New England Lime Co., which had been carried on there for a century.

* * *

The Valley View Lime Co., of Bellefonte, Pa., expanded its operations by constructing a new hydrating plant. Equipment included Gifford-Wood elevators and a Schulthess hydrator. New crushers, bins and conveyors were also installed.

Pipe Welding Explained in Recent Publication

The Gas Products Assn., 250 E. Ontario St., Chicago, an association of independent manufacturers of gas-welding and cutting equipment and supplies, has issued a 44-page booklet on Pipe Welding. This booklet contains, in condensed form, complete information on all the important phases in the various types of welded-steel and wrought-iron piping systems for industrial uses. Tables of cost data for the welding and cutting of all sizes of pipe from ⅜ in. to 30 in. diameter are included.

The book is available to the industry through any of the association members or by direct application to the association office, at the price of fifty cents.

Will Furnish Equipment for Hoover Dam Project

Another step in the construction of the Boulder Canyon project was taken recently by Six Companies Inc. of San Francisco, when it awarded to the Westinghouse Electric & Manufacturing Co. the contract for the electrical equipment of the Hoover dam according to W. R. Marshall, commercial vice president of the Westinghouse Electric & Manufacturing Company. A large part of the equipment covered by this huge contract will be built in the Westinghouse works at Oakland, Cal. The award includes motors and control for driving all electric shovels, hoist pumps, conveyor and compressors, also electric lomotives, switching equipment, circuit breakers, switchboards and transformers, lightning arresters, and meters. Manufacture and delivery of this machinery will start at once.

Geological Reports on Illinois Gravels, Clays

The State Geological Survey of Illinois has published its No. 22 Report of Investigations, a bulletin on Refractory Clays in Calhoun and Pike Counties, by J. E. Lamar.

The Survey has issued a reprint of an article by J. E. Lamar entitled Chert Gravel as Sewage Filter Stone; and a bulletin containing reprints of the following: What the Paleozoic Submergencies Did for the Great Midwest, by Dr. M. M. Leighton, published in full in PIT AND QUARRY, Sept. 24, 1930; Earth Movements and the Accumulation of Oil and Gas, by Dr. Carey Croneis, University of Chicago; and Our Inheritances from the Ice Age, by Dr. Paul MacClintock, Princeton University. These three addresses were delivered before the Western Society of Engineers, Chicago.

The Morris Machine Works has recently moved its Chicago office to 211 West Wacker Drive.

Personal Mention

Clare A. Parks has been placed in charge of the office in Seattle of the Asbestos Bureau, Inc., which includes in its membership the foremost asbestos firms in the Pacific Northwest. In addition to managing the bureau affairs, Mr. Parks will have charge of quantity surveys in connection with the use of asbestos and asbestos products in building construction.

George A. Ricker, formerly Washington representative and more recently manager of the general educational bureau at the Chicago headquarters of the Portland Cement Association, has been appointed industrial consultant to the National Capital Park and Planning Commission in Washington, D. C.

George A. Long, recently appointed as manager of the Bay City, Mich., and Cleveland, O., plants of the Industrial Brownhoist Corp., has taken a residence in Bay City.

George S. Bartlett, of Chicago, special representative of the Universal Atlas Cement Co., has been retired under the 70-year retirement rule of the United States Steel Corp. and has been appointed assistant to **Frank H. Smith,** president of the Portland Cement Association.

Charles O. Hutchins, formerly of the Wyoming Sand & Stone Co., has reorganized the Lanesboro Sand & Gravel Co. of Lanesboro, Pa. The operation will henceforth be known as the Concrete Aggregates Corp.

J. B. Sneed, Post, Tex., and **S. C. Campen,** Temple, Tex., are reported to have acquired caliche deposits on the Belton-Killeen highway. They will organize a company to develop the deposits which are located near Belton, Tex.

H. L. Leas recently contracted to reopen a quarry once owned by railroad company at Monona, Iowa, to furnish pulverized stone for agricultural purposes.

H. E. Millen, manager of the Douds Stone Co., and **W. C. Osborn** of Keosauqua, Iowa, are reported to have been prospecting for sand and gravel near Farmington, Ia., with the intention of building plant near there.

Dr. R. E. Lee, Oxford, Ind., will soon open a gravel pit three miles east of Oxford, according to press reports.

Neil E. Salsich has been elected vice-president and general sales manager of the Jeffrey Manufacturing Co., Columbus, O. Prior to joining the Jeffrey organization, Mr. Salsich was associated with the Bethlehem Steel Co. as manager of railroad and mining sales.

Neil E. Salsich.

Mr. Salsich is a native of Wisconsin, having been born at Hartland. He attended Beloit College, Beloit, Wisconsin, and then joined the Pennsylvania Steel Company, Steelton, Pa., in January, 1903. He remained with that company and the Bethlehem Steel Company, by which it was absorbed, for 28 years.

R. H. Bacon, former advertising manager of Fairbanks, Morse & Co., has been named manager of the pump-sales division with headquarters in Chicago. Mr. Bacon has been associated with the company since 1925, when he took charge of publicity for the Diesel-engine division. Shortly thereafter he was placed in charge of general publicity and since 1929 has been manager of the Advertising and Publicity Dept. From 1922 to 1925 he was associate editor of *Power Plant Engineering.* Prior to that time he was assistant engineering editor of *Electrical World* and for three years had been assistant electrical engineer for the Copper Range Mining Co. He is a graduate electrical engineer of the University of Illinois.

R. H. Bacon.

H. A. Sawyer has been elected vice-president and manager of the Lone Star Cement Co., Louisiana, of New Orleans, according to an announcement by **H. Struckmann,** president. He succeeds **Scott Thompson,** who was named vice-president and manager of Cia Nacional de Cimento Portland at Rio de Janeiro, Brazil, S. A. Both concerns are subsidiaries of International Cement Corp.

S. M. Kintner, who has been assistant vice-president of the Westinghouse Electric & Manufacturing Co., was elected vice-president in charge of engineering at a recent meeting of the board of directors. He succeeds **W. S. Rugg,** who has been elected vice-president in charge of sales.

R. E. J. Summers has resigned as vice-president and contract manager of the H. K. Ferguson Co., Cleveland, and with a group of associates has organized Summers Engineers & Constructors, Inc., which will specialize in industrial engineering and construction. Offices have been opened in the Terminal Tower Building, Cleveland, and the Graybar Building in New York.

W. W. Wilson, Detroit, has been appointed as agent for the Alloy Metal Wire Co., Inc., of Moore, Pa. His offices are located in the General Motors Bldg.

James L. Mahon, president of the American Car & Foundry Co., has been elected president of the Detroit Foundrymen's Assn.

M. B. Beltz, for the past four years engineer for the Washtenaw county road commission, has resigned to accept a position with the Wisconsin State Highway Department.

Obituary

Walter Emsweller, a member of the firm of George & Emsweller, producers of crushed stone and agricultural limestone at New Salem, Ind., died of heart disease on Wednesday, May 13. The business will be carried on by A. H. George, the surviving partner, under the name of A. H. George Stone Co.

Latest Portland-Cement Statistics

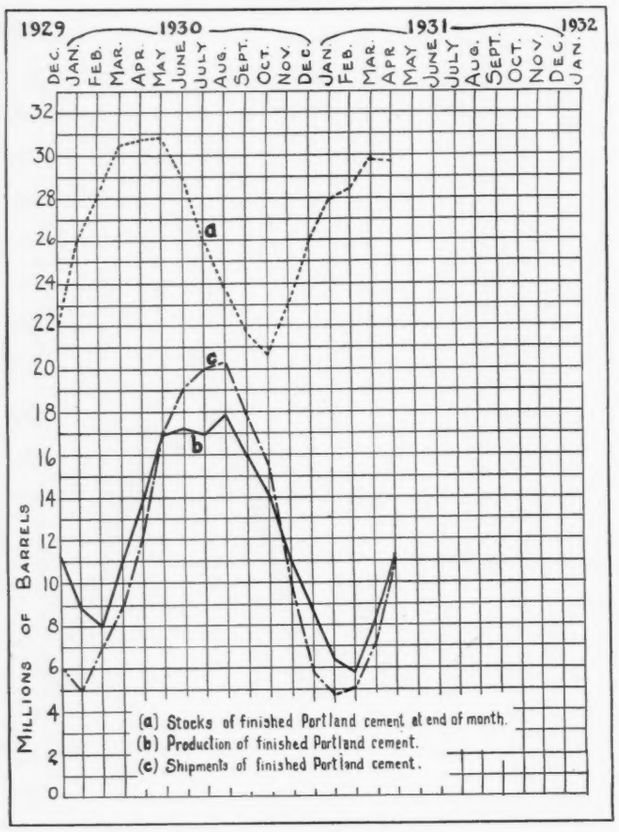


Chart showing production, shipments and stocks on hand, by months, from December, 1929, to April, 1931.

THE Portland-cement industry in April, 1931, produced 11,245,000 barrels, shipped 11,184,000 barrels from the mills, and had in stock at the end of the month 29,736,000 barrels. Production of Portland cement in April, 1931, showed a decrease of 16.8 per cent. and shipments a decrease of 16.2 per cent., as compared with April, 1930. Portland cement stocks at the mills were 3.7 per cent. lower than a year ago.

In the statement of relation of production to capacity the total output of finished cement is compared with the estimated capacity of 165 plants both at the close of April, 1931, and of April, 1930. The estimates include increased capacity due to extensions and improvements during the period.

EXPORTS OF HYDRAULIC CEMENT BY COUNTRIES IN MARCH, 1931

Exported to—	Barrels	Value
Canada	1,943	$ 7,356
Central America	13,853	28,726
Cuba	6,319	15,269
Other West Indies and Bermuda	2,543	4,257
Mexico	2,986	11,716
South America	23,121	54,855
Other Countries	3,834	22,400
Total	54,599	144,579

DISTRIBUTION OF CEMENT

Shipped to—	February		March	
	1930	1931	1930	1931
Alabama	135,425	103,610	104,750	175,601
Alaska	132	159	864	1,111
Arizona	35,218	36,834	44,917	53,821
Arkansas	80,512	43,685	86,481	74,368
California	695,831	532,384	718,840	691,790
Colorado	43,570	32,603	57,317	42,724
Connecticut	60,197	40,716	109,085	82,833
Delaware	16,100	15,566	19,467	14,473
District of Columbia	48,482	56,388	70,893	76,232
Florida	82,931	60,601	87,400	49,466
Georgia	90,938	81,500	101,858	151,326
Hawaii	25,734	28,265	22,829	24,602
Idaho	9,943	7,472	18,305	16,408
Illinois	356,200	227,023	379,453	279,580
Indiana	189,599	108,914	201,551	130,801
Iowa	111,155	73,262	117,907	121,769
Kansas	191,412	111,835	178,877	133,354
Kentucky	74,974	73,215	72,496	97,970
Louisiana	285,398	156,356	285,435	216,170
Maine	14,370	9,015	33,975	19,556
Maryland	101,896	71,391	172,822	103,592
Massachusetts	89,617	69,184	191,190	151,893
Michigan	258,450	170,815	344,412	200,479
Minnesota	111,059	62,726	91,055	106,842
Mississippi	48,264	31,532	56,606	29,594
Missouri	244,403	182,133	264,930	221,789
Montana	12,497	10,912	18,316	19,072
Nebraska	71,051	49,142	83,042	58,027
Nevada	8,306	6,231	11,923	9,804
New Hampshire	9,612	7,359	19,963	11,868
New Jersey	252,624	151,941	456,109	285,359
New Mexico	16,490	14,839	23,641	23,879
New York	663,031	622,266	1,095,878	1,035,782
North Carolina	75,768	42,771	101,751	92,639
North Dakota	10,070	5,790	20,791	17,176
Ohio	403,404	219,903	425,559	308,587
Oklahoma	234,569	125,682	283,365	136,628
Oregon	67,025	38,148	101,258	84,549
Pennsylvania	488,412	343,903	700,482	458,913
Porto Rico	1,750	1,020	2,125	2,672
Rhode Island	18,256	11,454	45,477	25,935
South Carolina	49,865	298,443	62,241	214,460
South Dakota	31,133	21,300	28,448	28,631
Tennessee	110,578	56,391	143,103	91,664
Texas	508,921	309,196	618,703	428,923
Utah	21,954	13,991	40,937	28,086
Vermont	14,964	2,014	23,132	7,389
Virginia	97,003	81,003	120,043	118,992
Washington	124,926	129,223	214,098	174,642
West Virginia	62,589	56,430	75,381	70,953
Wisconsin	140,053	85,088	159,096	119,628
Wyoming	6,225	5,333	9,934	8,585
Unspecified	17,732	63,233	40,274	16,947
	6,920,618	5,070,190	8,758,785	7,147,934
Foreign countries	91,382	3,810	67,215	44,066
Total shipped from cement plants	7,012,000	5,074,000	8,826,000	7,192,000

IMPORTS OF HYDRAULIC CEMENT BY COUNTRIES AND BY DISTRICTS, IN MARCH, 1931

Imported from—	District into which imported	Barrels	Value
Belgium	New York	5,053	$ 4,215
	Porto Rico	1,006	1,850
	Total	6,059	6,065
Denmark	New York	37,038	43,852
	Porto Rico	18,519	21,430
	Total	55,557	65,282
France	Los Angeles	154	326
Japan	Hawaii	4,366	4,607
Yugoslavia	New York	1,464	1,252
	Philadelphia	2,932	3,154
	Total	4,396	4,406
	Grand total	70,532	80,686

RELATION OF PRODUCTION TO CAPACITY

	April		March	February	January
	1930 (*per cent*)	1931 (*per cent*)	1931 (*per cent*)	1930 (*per cent*)	1930 (*per cent*)
The month	64.0	52.1	36.9	29.4	29.5
The 12 months ended	66.0	57.7	58.6	59.7	60.6

PRODUCTION, SHIPMENTS, AND STOCKS OF FINISHED PORTLAND CEMENT, BY MONTHS, IN 1930 AND 1931 (*In thousands of barrels*)

Month	Production		Shipments		Stocks at End of Month	
	1930	1931	1930	1931	1930	1931
January	8,498	6,595	4,955	4,692	27,081	27,759
February	8,162	5,920	7,012	5,074	28,249	28,612
March	11,225	8,245	8,826	7,192	30,648	29,676
April	13,521	11,245	13,340	11,184	30,867	29,736
May	17,249	.....	17,224	.....	30,891	.....
June	17,239	.....	18,781	.....	29,364	.....
July	17,078	.....	20,153	.....	26,289	.....
August	17,821	.....	20,299	.....	23,824	.....
September	16,124	.....	18,083	.....	21,889	.....
October	14,410	.....	15,599	.....	20,697	.....
November	11,098	.....	8,784	.....	23,056	.....
December	8,480	.....	5,688	.....	25,883	.....
Totals	160,905	.....	158,744	.....	.....	.....

PRODUCTION AND STOCKS OF CLINKER, APRIL 1930 AND 1931 (*In thousands of barrels*)

District	Production		Stocks at End of Month	
	1930	1931	1930	1931
Eastern Pa., N. J., and Md	3,264	2,699	2,461	1,934
New York and Maine	1,081	979	1,081	1,470
Ohio, Western Pa., and W. Va	1,640	897	1,845	1,720
Michigan	907	486	2,053	1,820
Wis., Ill., Ind., and Ky	1,829	1,419	2,482	1,928
Va., Tenn., Ala., Ga., Fla., and La	1,335	1,238	964	865
Eastern Mo., Ia., Minn., and S. Dak	1,547	1,256	1,158	1,021
W. Mo., Neb., Kans., Okla., and Ark	1,199	648	519	848
Texas	643	565	404	288
Colo., Mont., Utah, Wyo., and Idaho	234	234	183	286
California	946	835	1,406	1,131
Oreg. and Wash	400	284	608	390
Totals	15,025	11,540	15,164	13,701

PRODUCTION, SHIPMENTS, AND STOCKS OF FINISHED PORTLAND CEMENT, BY DISTRICTS, IN APRIL 1930 AND 1931, AND STOCKS IN MARCH, 1931 (*In thousands of barrels*)

District	April						Stocks at End of March
	Production		Shipments		Stocks at End of Month		
	1930	1931	1930	1931	1930	1931	1931
Eastern Pa., N. J., and Md	3,067	2,691	3,127	2,587	7,037	6,725	6,622
New York and Maine	999	832	839	769	1,862	2,076	2,013
Ohio, Western Pa., and W. Va	1,458	829	1,375	919	3,965	3,476	3,565
Michigan	562	524	702	529	2,595	2,595	2,600
Wis., Ill., Ind., and Ky	1,366	1,231	1,265	1,260	4,691	4,208	4,237
Va., Tenn., Ala., Ga., Fla., and La	1,262	1,268	1,239	1,343	1,751	1,639	1,714
Eastern Mo., Ia., Minn., and S. Dak	1,415	1,261	1,230	1,029	4,049	4,064	3,833
W. Mo., Neb., Kans., Okla., and Ark	1,160	674	1,264	942	1,837	1,928	2,196
Texas	757	585	776	581	825	777	773
Colo., Mont., Utah, Wyo., and Idaho	286	233	262	184	540	601	552
California	838	793	921	733	1,130	1,058	998
Oreg. and Wash	351	324	340	308	585	589	573
Totals	13,521	11,245	13,340	11,184	30,867	29,736	29,676

EXPORTS AND IMPORTS OF HYDRAULIC CEMENT, BY MONTHS, IN 1930 AND 1931

Month	Exports				Imports			
	1930		1931		1930		1931	
	Barrels	Value	Barrels	Value	Barrels	Value	Barrels	Value
January	82,387	$293,135	41,199	$115,678	201,609	$207,461	97,057	$132,937
February	64,267	217,798	25,703	88,989	114,455	119,717	22,370	26,250
March	117,563	357,896	54,599	144,579	43,622	59,981	70,532	80,686
April	57,419	200,217	.....	.....	140,871	178,226	.....	.....
May	57,423	198,170	.....	.....	94,696	111,998	.....	.....
June	82,077	223,639	.....	.....	55,356	74,370	.....	.....
July	47,082	166,577	.....	.....	12,404	20,973	.....	.....
August	49,031	167,579	.....	.....	35,323	39,029	.....	.....
September	46,594	153,384	.....	.....	51,096	59,721	.....	.....
October	62,690	190,305	.....	.....	75,284	84,364	.....	.....
November	50,495	151,555	.....	.....	109,124	125,448	.....	.....
December	38,680	134,260	.....	.....	44,157	59,641	.....	.....
Totals	755,708	2,454,515	.....	.....	977,997	1,140,929	.....	.....

PRODUCTION AND STOCKS OF CLINKER BY MONTHS, IN 1930 AND 1931 (*In thousands of barrels*)

Month	Production		Stocks End of Month		Month	Production		Stocks End of Month	
	1930	1931	1930	1931		1930	1931	1930	1931
January	10,504	8,129	9,646	10,384	July	15,069	.....	11,684	.....
February	10,008	7,473	11,572	11,946	August	15,244	.....	9,275	.....
March	13,045	9,586	13,503	13,318	September	14,577	.....	7,783	.....
April	15,025	11,540	15,164	13,701	October	13,895	.....	7,266	.....
May	16,607	.....	14,668	.....	November	11,639	.....	7,758	.....
June	15,895	.....	13,452	.....	December	9,484	.....	8,809	.....

Ready-Mixed Literature Available to Producers

The National Ready-Mixed Concrete Assn., announces that a number of publications having to do with the manufacture of central-mixed concrete are now available. The list of printed booklets is as follows:

"Estimating Quantities of Concrete," by Stanton Walker, director of engineering, National Ready Mixed Concrete Assn., Washington, D. C.

"Pre-Mix Concrete from the Viewpoint of the User," by Henry D. Johnson, designing engineer, Bureau of Bridges and Structures, Pittsburgh, Pa.

"The Proportioning of Concrete for Strength, Durability and Impermeability," by A. T. Goldbeck, director, Bureau of Engineering, National Crushed Stone Assn., Washington, D. C.

The following mimeographed publications are also announced:

"Strength Specifications for Ready-Mixed Concrete," by J. L. Shiely, J. L. Shiely Co., Inc., St. Paul, Minn.

"Central-Mix Concrete in Philadelphia," by H. J. Whitten, Warner Co., Philadelphia, Pa.

"Effect of Haul on Strength of Concrete." (Describes results of few tests carried out by J. L. Shiely Co., St. Paul, Minn.; not yet released for publication.)

"Effect of Period of Agitating Ready-Mixed Concrete." (Describes results of tests carried out by Thompson & Lichtner Co., Inc., Boston, Mass., for the Boston Concrete Corp.; not yet released for publication.)

Traffic News and Comment

Examiners' Reports

Cement.—In publishing rates on cement as prescribed by the commission in New England Cement Rates, 155 I. C. C. 601, the carriers have asked for fourth-section relief on traffic from producing points in the Lehigh district of Pennsylvania and New Jersey; the Hudson district of New York, Rockland, Me., and Binnewater, N. Y., to destinations in New England, including points on the Aroostook Valley in Application No. 13,968. The proposed report of Examiner M. L. Boat contains the following matter which is of general interest, not only to the cement industry, but to any producer whose rates are based on a mileage scale applicable by the use of the shortest distance over which the traffic could move without transfer of the lading. "Applicants urge that it is a special case not grounded upon circuity but upon other compelling special circumstances. They admit that most of the petitioning lines or routes are to some degree circuitous but disclaim that characteristic or circumstance as a ground for the relief sought. They ask that relief be granted, free from circuity limitations and the equidistant rule, in order that they may continue intact the rate structure which the commission has prescribed as reasonable and nonprejudicial."

The method of computing distances in the application of the rates prescribed in the New England case is typical of that which the commission has in recent years required carriers to use in the determination of rates under numerous adjustments based on scales of distance rates, including all the class-rate structures which it has prescribed. The commission has yet to consider the question of permanent relief in connection with any one of these adjustments. For these reasons the principles established in this proceeding, considering the extent to which relief may be justified in connection with rates thus determined, are of particular importance.

The situation which gives rise to the departure in respect of which relief is sought is as follows: In general, all the departures grow out of the practice of basing on distances which frequently differ in varying degree from the distances over the shortest operating or tariff routes, generally referred to by applicants as working routes, between given points, namely, those routes over which the traffic could move.

A logical and practical application of circuity limitations rests upon the use of the distance over the shortest tariff route as a basis for the determination of the circuity of other tariff routes. To use the shortest possible distance as a basis leads to the conclusion that the shortest open route, which is frequently of greater length than the route over which the shortest possible distance can be computed, is a circuitous route, notwithstanding the fact that it is the shortest route over which the traffic may move. The use of the shortest possible distance as a basis in the present case is also objectionable from a practical standpoint. Generally speaking, this distance represents an average of such distances from a number of origins, or the distance from a central origin point, and is in no way related to the shortest possible distance from a given origin point. Its use would exclude all open routes from relief in every case where the distance over the shortest of such routes, from and to given points, exceeds the shortest possible distance by a greater percentage than that included in the limitation. For these reasons the circuity of all routes in connection with which relief is herein recommended should be determined by the distance over the shortest open route.

Since most of the rates are based on the shortest possible distances, the use of distances over the shortest tariff routes, as a basis for computing circuity, will allow a wider extension of the relief than would be possible if the maximum circuity were determined on the basis of the shortest possible distances.

It is recommended that the relief sought, excepting that relating to intrastate rates, be granted, subject to the following conditions: That the rates from, to, and between intermediate points as to which relief is authorized shall in no case exceed the lowest combination of rates subject to the act; and that the relief shall not apply (1) where the distance over the shortest tariff route is 150 mi. or less and the longer route in more than 70 per cent. circuitous, and (2) where the distance over the shortest tariff route exceeds 150 mi. and the longer route is more than 50 per cent. circuitous; provided, that, where the distance over the shortest tariff route exceeds 15 mi. and the distance over the longer route does not exceed 225 mi., relief will apply to the longer route even though it is more than 50 per cent. circuitous.

Complaints Filed

Plaster.—Complainant and Centainteed Products Corp., intervener, ask reconsideration, rehearing and oral argument before the entire commission in Docket No. 22,561, Texas Cement Plaster Co. v. C. of Ga. *et al.*

Sand.—Unreasonable rates and charges on sand from Leavenworth, Kan., to New Market, Mo., as compared with rates from other sand-producing points on the Missouri River at St. Joseph and Kansas City are alleged and new rates and reparation are sought in I. C. C. Docket No. 24,393, Dresser Sand Co., Leavenworth, Kan. v. C. G. W.

Crushed Stone, Sand and Gravel.—Complainant alleges rates in violation of Sec. 3 and 13 on crushed stone, sand and gravel, and that, in selling crushed stone from Atlas, Highland and Limestone, Ky., at points in West Virginia, it is in competition with crushed stone produced and shipped from Fultonham, Highway, Spore, West Columbus, White Cottage, O., Cascade, Greer, Pierce, and Snow Flake, W. Va., and is in competition with sand and gravel produced and shipped from Charleston, Huntington, Kenova, Moundsville, New Martinsville, Parkersburg and Point Pleasant, W. Va., and asks for rates and reparation in I. C. C. Docket No. 24,394, Olive Hill Limestone Co., Olive Hill, Ky. v. B. & O. *et al.*

Fourth-Section Relief

Fourth-section relief has been granted the carriers in connection with the publication of rates on ground limestone from Barber, Va., and related points on application of the C. & O. (No. 14,349) for itself and on behalf of carrier defendants in No. 22,771, Falling Springs Lime Co., Inc. v. *et al.*, also carriers parties to Glenn's Southern Rate Basis I. C. C. A-725.

Fourth-Section Applications

The C. & N. W. and the C. M. St. P. & P. have asked for relief in connection with the establishment of rates on sand and gravel from South Beloit, Ill., to Milwaukee, Wis. App. No. 14,363.

Rate-Committee Dockets

New England Freight Assn.

Sand.—To meet competitive conditions, shippers propose that the rate on building, common or run-of-bank sand, c.-l. min. wt. Note 1, from Montowese and Northford, Conn., to Stamford, Conn., be reduced from 13½ c. per 100 lb., to 65 c. a net ton. Docket No. 22,523.

Sand and Gravel.—To meet motor-truck competition, it is proposed to reduce the rates on sand and gravel, c.-l. min. wt. 100,000 lb., from Scotia, N. Y., to Saratoga Springs, N. Y. The present rate on common sand and run of bank gravel is 70 c. and the proposed rate 62 c. a net ton. The present rate on screened or crushed gravel is 80 c. and the proposed rate 70 c. a net ton.

Trunk Line Assn.

Cement.—It is proposed by shippers to restrict the application of class rates so as not to apply on car-load shipments of Portland cement originating at Lehigh cement-producing points and destined to Minnesota, Wisconsin and Michigan arbitrary points, subject to Notes 22, 36, 37, 38, 57, 66, 67 and 68 shown in Curlett's I. C. C. A-259; to accord cement shippers the same privilege as accorded shippers of various commodities shown in the above notes. Docket No. 26,862.

Crushed Stone, Sand and Gravel.—To meet water competition, carriers propose reductions on crushed stone, c.-l. min. wt. in ordinary equipment Note 1, in containers loaded on container cars, 110,000 lb., from Marlboro, N. Y., to Milton, Highland (West Park), Esopus, Ulster Park, Port Ewen and Kingston, N. Y., to 60 c. a net ton, and to Lake Katherine and Mt. Marion, N. Y., to 70 c. a net ton; and on sand and gravel loaded in steel shipping containers on container cars, c.-l. min. wt. 110,000 lb., from Newburgh, N. Y., to Kingston and Mt. Marion, to 70 c. a net ton. The proposed rates to include transfer of load from cars at destination. Docket No. M-1,755.

Sand and Gravel.—Shippers at Cumberland, Md., are asking for a rate of $1.30 a net ton on sand and gravel, c.-l. min. wt. Note 1, to apply to the following destinations: Marion, Towson, Jessop, Mountain View, Howesville, Mattingly, Irona, Snider, Kingwood Jct., and Kingwood, W. Va. Docket No. 26,731.

To meet water competition it is proposed to reduce the rate on sand and gravel, c.-l. min. wt. Note 1, from South Lakewood and Farmingdale, N. J., to Port Monmouth, N. J., from 60 c. to 50 c. per net ton. Docket No. 26,787.

Central Freight Assn.

Crushed Stone.—Carriers propose to publish commodity rates on crushed stone and agricultural limestone in open-top cars, c.-l. min. wt. Note 1, from Narlo, O., as follows. Rates shown are per net ton. Docket No. 28,343.

To	
Stoneboro, Pa.	$1.60
Franklin, Pa.	1.70
Oil City, Pa.	1.70
Warren, Pa.	2.00
Titusville, Pa.	2.10

Reduced rates on crushed stone and agricultural limestone in open-top cars, c.-l. min. wt. Note 1, are proposed by carriers as shown below. Rates are per net ton, and apply from the following producing points (1) Genoa and Martin, O., (2) Apex, O., (3) Belleville, O., (4) Marblehead, O., (5) Sandusky, O. Docket No. 28,419.

To	(1)	(2)	(3)	(4)	(5)
Franklin Pa.	$1.60	$1.50	$1.40	$1.50	$1.40
Stoneboro, Pa.	1.50	1.40	1.40	1.40	1.30
Titusville, Pa.	2.00	2.00	1.80	1.90	1.80
Warren, Pa.	1.80	1.80	1.70	1.70	1.30
Andover, O.	...	...	...	1.40	1.20
Simons, O.	...	...	...	1.40	1.30
Jefferson, O.	...	...	...	1.40	1.10

Crushed Stone.—Shippers are proposing a commodity rate on crushed stone, crushed-stone screenings, agricultural limestone, and agricultural-limestone screenings, in bulk in open-top cars, c.-l. min. wt. Note 1, from Bellevue, O., to Braceville and Phalanx, O., of 90 c. per net ton. The sixth-class rate now applies. Docket No. 28,427.

Reduced rates from Woodville and Gibsonburg, O., are asked to apply on crushed stone, crushed-stone screenings and agricultural limestone, in bulk in open-top cars, c.-l. min. wt. Note 1, as follows: To Kalamazoo, Mich., $1.45; to Schultz, Mich., $1.55; to Woodbury, Mich., $1.65 per net ton. The present rate to Kalamazoo is $1.55 and the classification basis applies to the other two points. Docket No. 28,432.

It is proposed to reduce the rate on crushed stone, crushed-stone screenings and agricultural limestone, in bulk, in open-top cars, from Sandusky, O., to Ceylon and Vermilion, O., from 60 c. to 50 c. a net ton. Docket No. 28,445.

Shippers at Greencastle, Ind., are proposing a reduction in the rate on crushed stone to Loogootee and Shoals, Ind., from $1.10 to $1.00 a net ton. Docket No. 28,462.

Fluxing Stone.—Shippers at Fultonham and White Cottage, O., are asking for reduced rates on fluxing stone, c.-l. min. wt. Note 1, as shown below. Rates are shown per gross ton of 2,240 lb. Docket No. 28,437.

To	Present	Proposed
Ashland, Ky.	$3.60	$1.12
Ironton, O.	1.39	1.01
Portsmouth, O.	1.39	1.01

Roasted Dolomite.—Shippers at Carey, O., are asking that the rate on roasted dolomite, c.-l. min. wt. Note 1, to Detroit, Mich., be reduced from $1.90 to $1.54 a net ton. Docket No. 28,418.

Sand.—It is proposed to reduce the rates on sand, (blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica) in open-top cars, from James Siding and Jones Siding, Pa., as shown below. Rates are per net ton. Docket No. 28,446.

To	Present	Proposed
Aliquippa, Pa.	$1.51	$1.20
Beaver Falls, Pa.	1.51	1.20
Braddock, Pa.	1.80	1.30
Butler, Pa.	1.39	1.20
Corry, Pa.	1.26	1.10
Ellwood City, Pa.	1.39	1.20
Erie, Pa.	1.40	1.10
Franklin, Pa.	.88	.60
Greenville, Pa.	1.13	1.00
Grove City, Pa.	1.26	1.10
Homestead, Pa.	1.80	1.30
McKees Rocks, Pa.	1.76	1.30
Meadville, Pa.	1.26	.90
Monessen, Pa.	2.27	1.40
Monaca, Pa.	1.51	1.20
New Castle, Pa.	1.39	1.10
Oil City, Pa.	.88	.60
Pittsburgh, Pa.	1.76	1.30
Sharon, Pa.	1.39	1.00
Sharpsville, Pa.	1.39	1.00
Washington, Pa.	1.76	1.60
West Newton, Pa.	2.27	1.40
Youngstown, O.	1.39	1.00

Sand and Gravel.—Shippers are asking for a reduction in the rates on common sand and gravel, c.-l. min. wt. marked capacity of car, from Evansville, Ind., to Browns, Ill., from $1.01 to 88 c. a net ton. Docket No. 28,394.

Illinois Freight Assn.

Agricultural Limestone.—A new scale for making rates on agricultural limestone, in bags, barrels or in bulk, c.-l. min. wt. 60,000 lb., from Buffalo and Linwood, Ia., to destinations in Illinois has been proposed. Rates shown are per net ton. Docket No. 6,066.

Distance	Present	Proposed
5 mi. to 30	$0.60	$0.63
55 mi.	.70	.63
60 mi.	.90	.63
65 mi.	.90	.63
70 mi.	.90	.76
80 mi.	.90	.76
85 mi.	.90	.88
90 mi.	1.00	.88
100 mi.	1.00	.88

Chalk.—A reduction in the rate on precipitated chalk, in bags, barrels, or boxes, in bulk, c.-l. min. wt. 40,000 lb., from Mosher, Mo., to Chicago, Ill., from 52½ c. to 20 c. per 100 lb., is proposed. Docket No. 6,135-A.

Roasted Dolomite.—It is proposed to reduce the rate on burnt or roasted dolomite, c.-l. min. wt. 60,000 lb., from Chicago group to St. Louis group, from $4.40 to $2.10 a net ton. Docket No. 4,231 Sub. 3.

Soapstone.—The present rate on soapstone (ground), c.-l. min. wt. 40,000 lb., from Joliet, Ill., to E. St. Louis, Ill., is $4.30 per net ton, and the proposed rate $1.85. Docket No. 6,179.

Western Trunk Lines

Agricultural Limestone.—It is proposed to establish, as a basis for rates on agricultural limestone, c.-l. min. wt. 90 per cent. of marked capacity of car but not less than 40,000 lb., between all points in the state of South Dakota, 90 per cent. of the present commercial crushed-stone rates. Docket No. 7,589.

Shippers at Valmeyer, Ill., are proposing through joint rates on agricultural limestone, c.-l. min. wt. Note 1 but not less than 60,000 lb., to points on the M. K. & T. A few representative rates are shown below. A complete exhibit will be furnished on request. Mileages are figured via M. P., St. Louis, M. K. & T. Docket No. 6,025-D.

To	Miles	Rate
Black Walnut, Mo.	56	$1.00
St. Charles, Mo.	65	1.05
Mokane, Mo.	151	1.45
Columbia, Mo.	205	1.65
Moberly, Mo.	250	1.75

Sand and Gravel.—Revised rates on sand and gravel, c.-l. min. wt. Note 1, but not less than 40,000 lb., from Chillicothe, Ill., are proposed by shippers. Representative rates are shown below. A complete copy of exhibit will be furnished on request. Docket No. 4,742-K.

To	Miles	Present	Proposed
West Keithsburg, Ia.	91	$2.00	$1.20
Morning Sun, Ia.	107	2.00	1.25
Martinsburg, Ia.	164	2.20	1.50
Oskaloosa, Ia.	187	2.20	1.60
Albia, Ia.	211	2.30	1.65

Southern Freight Assn.

Amiesite.—It is proposed to revise the rates on crushed stone, coated with oil, tar or asphaltum (amiesite), c.-l. min. wt. Note 1, from Snow Flake, W. Va., to Elizabeth City, Reidsville, Durham, and Fayetteville, N. C., and also establish rates to other destinations in Carolina Territory on the basis of the mileage scales prescribed by the commission in I. C. C. Docket No. 22261. A statement of rates to representative points will be furnished on request. Docket No. 55,021.

Mica.—Shippers are asking that rates be established on dry ground mica, c.-l. min. wt. 50,000 lb., to Freeport, Ill., from southern producing points on the same basis as those applicable to Chicago, which are, from Atlanta, Ga., 37 c., Biltmore, N. C., 36 c., East Point, Ga., 37 c., and from Franklin, N. C., 38 c. per 100 lb. Docket No. 54,905.

Soapstone and Talc.—It is proposed to publish a rate on pulverized soapstone and talc (asphalt filler and surfacer), c.-l. min. wt. 90 per cent. of the marked caption of the car but not less than 67,000 lb., from Birmingham, Ala., to Mobile, Ala., of $2.85 a net ton. Docket No. 54,938.

Southwestern Freight Bureau

Cement Bags.—Shippers propose a classification exception authorizing one-half of the fourth-class rate on cement bags, empty, old, returned, l. c. l., from points in Arkansas, Louisiana and Texas, as per S. W. L. Tariff 6-1 to points in Colorado, Nebraska, New Mexico and Wyoming, as per that tariff. Such exception is to apply until such time as a decision is rendered in I. & S. Docket 3,423. Shippers in Colorado call attention to the fact that Texas cement plants are accorded one-half of fourth-class rates on empty sacks, returned, from Texas points as covered by Texas Lines Tariff 2-Series and the same basis is accorded shippers on returned shipments from Colorado under S. W. L. Tariff 14-N. The latest adjustment from Colorado was handled under Docket 20,224 and covered El Paso and related points as destinations. Since Texas shipments are accorded the proposed basis on Texas traffic, and also on Colorado-Texas traffic, it is believed there should be no objection to establishing the same basis from Texas to Colorado pending the decision in I. & S. 3,423 and related cases. Docket No. 22,808.

[1] The proposed car-load minimum weight will be 90 per cent. of the marked capacity of the car except that, when the car is loaded to full cubical or visible capacity, the actual weight will apply.

Observing Five Simple Rules Makes Conveyor Belts Last Longer

By W. E. PHILIPS
Engineer, Link-Belt Co.

HOW to increase conveyor life, is a question that greets me throughout my travels. As an answer to this popular question, I would say that five simple things materially increase the life of the average belt-conveyor installation.

What I have to say is based on the assumption that, when the conveyor was originally installed, the idlers were lined up squarely with the belt; that an experienced engineer's advice was taken when determining the belt design for the material to be handled; and that the belt was lined up correctly with the idlers.

Even though the original installation was correctly engineered, it requires some attention to get the best results afterward, just as an automobile does if the utmost satisfaction be desired.

The five things to which I refer are:

1. *Lubrication.*—Sufficient greasing with the proper kind of grease, although infrequently needed. See Fig. 1.

2. *Cleanliness.*—Keep the space under the belt clean. Clean the decking

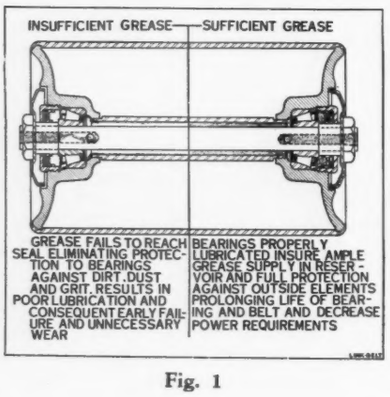

INSUFFICIENT GREASE
SUFFICIENT GREASE
GREASE FAILS TO REACH SEAL ELIMINATING PROTECTION TO BEARINGS AGAINST DIRT, DUST AND GRIT. RESULTS IN POOR LUBRICATION AND CONSEQUENT EARLY FAILURE AND UNNECESSARY WEAR
BEARINGS PROPERLY LUBRICATED INSURE AMPLE GREASE SUPPLY IN RESERVOIR AND FULL PROTECTION AGAINST OUTSIDE ELEMENTS PROLONGING LIFE OF BEARING AND BELT AND DECREASE POWER REQUIREMENTS

Fig. 1

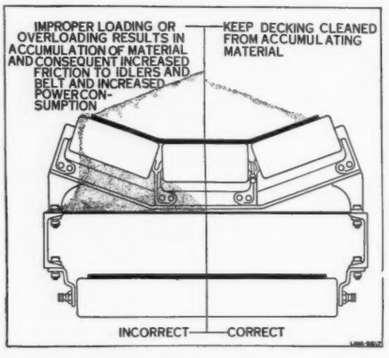

IMPROPER LOADING OR OVERLOADING RESULTS IN ACCUMULATION OF MATERIAL AND CONSEQUENT INCREASED FRICTION TO IDLERS AND BELT AND INCREASED POWER CONSUMPTION
KEEP DECKING CLEANED FROM ACCUMULATING MATERIAL
INCORRECT
CORRECT

Fig. 2

when material overflows and threatens to clog the idlers. Clogging increases the friction load, resulting in greater power consumption and wear on the driving mechanism, the idlers, and the belt. See Fig. 2.

3. *Loading.*—Do not overload. Use an idler sufficiently heavy, and a belt designed for the service expected. Have material reach the belt in the direction in which the belt is moving and with as little impact as possible. Use feeders when necessary as they create a steady flow of material without causing shock to the conveyor. See Fig. 3.

4. *Wear.*—There are many reasons for uneven or premature wear on belts and idlers. Belts scraping against framework, skirtboards or wedged material are the chief causes. Dragging idlers, caused by insufficient lubrication or clogged rolls, cause un-

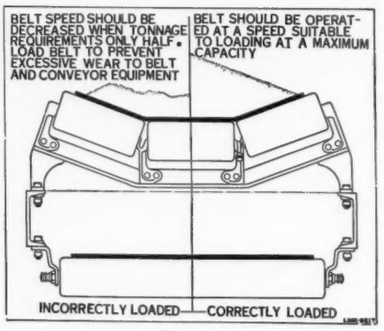

BELT SPEED SHOULD BE DECREASED WHEN TONNAGE REQUIREMENTS ONLY HALF-LOAD BELT TO PREVENT EXCESSIVE WEAR TO BELT AND CONVEYOR EQUIPMENT
BELT SHOULD BE OPERATED AT A SPEED SUITABLE TO LOADING AT A MAXIMUM CAPACITY
INCORRECTLY LOADED
CORRECTLY LOADED

Fig. 3

due wear on both the belt and the idler, and put an extra load on the driving mechanism.

5. *Training the Belt.*—Train the belt while empty. Then, if it runs out of line when loaded, it is because of unequal loading. Fix the loading chute or install a feeder. Adjustment can not be made by the take-ups on one side or the other. See that the belt contacts the center roll of the idler, because this roll steers the belt. Foundations for the idler should be firm and secure. Side or guide idlers should not be used when training the belt. Do not increase the belt's tension as this will injure the belt.

April Building Permits 7 Per Cent Above March

Building permits issued in 561 leading cities and towns throughout the United States during April totalled $172,346,394, a gain of 7 per cent. over March, according to official reports made to S. W. Straus & Co. The increase compares favorably with an anticipated seasonal decline of approximately 2.7 per cent. between the two months. Permits issued during April of this year fell off 16 per cent. from the same month of 1930, when the total was $205,543,923.

In the twenty-five cities reporting the largest volume of permits for the month, a collective gain of 13 per cent. over April, 1930, and 8 per cent. over March, 1931, was reported. Seventeen of these cities made individual gains over April of last year, namely, New York, Baltimore, St. Louis, Milwaukee, New Orleans, Boston, Pittsburgh, San Francisco, Minneapolis, University Heights, O., Yonkers, Ann Arbor, St. Paul, Denver, Buffalo, Des Moines, and Rochester.

Financial News

The information contained in these financial pages is given with the understanding that any statement on the part of this magazine or any of its staff, as to the responsibility or standing of any person, firm or corporation, or as to the value of any property or securities is a mere expression of opinion, given as a matter of service to the readers of PIT AND QUARRY, *for which no responsibility in any way is to attach to this magazine or to any of its staff.*

First Quarter Earnings of Texas Gulf Sulphur

Due to lessened industrial activity, with resultant contraction in demand for sulphur, the Texas Gulf Sulphur Corp. earned only 96 cents a share on its 2,540,000 common shares in the first quarter of 1931, as compared with $1.50 a share in the corresponding 1930 quarter. Net profit in the 1931 period did not cover the dividend requirement of $1 a share. Since there has been no change in basic conditions to alter the company's operations thus far in the present quarter, it seems unlikely that the second three months of 1931 will be materially better than the first, according to the *Wall Street Journal.*

Industrial concerns generally have been obliged to bend every effort to lower costs. This, as applied to those using sulphur as a part of their manufacturing processes, has meant pressure on Texas Gulf Sulphur for revision of contracts in the direction of lower prices. Thus far, however, contract prices have held.

Texas Gulf Sulphur is the leading sulphur company of the world. Together with the Freeport-Texas Co. it controls about three-fourths of the world's known sulphur supplies. The expected life of Texas Gulf's own dome at Matagorda, Tex., is only about ten years but the company has leases on deposits with an estimated life of 40 years. Direct returns to Texas Gulf from these leased properties will of course be proportionately less than in the case of its own dome. However, much can happen to change the picture in the next ten years, and the Texas Gulf management has won a good reputation for resourcefulness. With the exception of the current period, the profit trend of the company has been steadily upward in the past few years. Based on the 2,540,000 no-par shares outstanding, earnings were $4.76 a share in 1927, $5.71 a share in 1928, $6.39 in 1929 (a record figure) and $5.50 in 1930.

The financial position of the company shows the strength which consistent margin of earnings over dividends would suggest. Working capital position is strong, with cash of approximately $5,500,000, near the record figure.

Monolith Portland's 1930 Net 14 Cents per Share

Monolith Portland Cement Co. has reported 1930 net profits of $315,892.12 before depreciation and other fixed charges equal to more than 5½ times interest requirements on the $958,000 outstanding 6-per cent. first mortgage bonds, against $474,545 in 1929, a decrease of $158,562, or about 33 per cent. After depreciation, bond interest was earned more than two times.

Net profits after all charges including interest, amortization, depreciation, income-tax reserves as well as special reserve of $9,000, amounted to $21,244.30, equivalent to about 14 cents a share on the 150,000 cumulative 8-per cent. $10 par value preferred stock on which accumulation of dividends in arrears amount to $1 a share. Last sales of the preferred on the Los Angeles stock exchange were at 3¾. This compares with $219,189 earned in 1929, or $1.46 a preferred share.

Net sales for the year amounted to $1,720,692, against $2,421,168 in 1929.

Current assets as of December 31, last, amounted to $563,658.21, the current liabilities, $226,251.45. Of the current assets, $279,196.86 represented cash, and accounts and notes receivable.

Coy Burnett, president, stated operations in the first quarter this year were substantially ahead of the same period last year due in part to a general improvement within the industry and a large Hoover Dam contract.

Among encouraging developments was a slight increase in current prices in the Rocky Mountain district recently. This increase has a favorable effect on the plant of Monolith Midwest Company's plant at Laramie, Wyo., a subsidiary formed about a year ago, the common stock of which is wholly owned by Monolith Portland Cement Co. Its operations are not included in the 1930 statement.

Mr. Burnett recently estimated that cement consumption for the Hoover Dam project will be at a maximum of 1,400,000 bbl. a year and that over a period of five or six years the dam alone will take a total of 5,000,000 bbl. Allied projects are expected to consume 1,000,000 bbl. and other construction in the territory or arising from it should consume between 6,000,000 and 8,000,000 bbl. over the six years. It is understood that most of this will come from Southern California.

In addition the California gasoline tax of from $35,000,000 to $40,000,000 is expected to be largely devoted to a state-highway development program that will also demand large quantities of cement.

Gypsum's Earnings Good Despite Lowered Demand

The outstanding feature of United States Gypsum's 1930 operations was earnings equivalent to $4.01 a share, despite the fact that the plans only were operated at an average of 28 per cent. of capacity, according to a report issued by the statistical department of Graves, Banning & Co. It states that earnings from operations rose by 12.6 per cent. to $7,835,520, while net income amounted to $5,408,685, representing an increase of 6 per cent. over the previous year.

CURRENT DIVIDENDS

COMPANY	CLASS OF STOCK	DIVIDEND RATE	HOLDERS OF RECORD	PAYABLE	COMPANY	CLASS OF STOCK	DIVIDEND RATE	HOLDERS OF RECORD	PAYABLE
Alpha Portland Cement	Common	$0.25 qr.	Apr. 1	Apr. 25	Material Service	Common	$0.50 qr.	May 15	June 1
Bessemer Limestone & Cemen'	Class A	$0.75 qr.	Apr. 20	May 1	McWilliams Dredging	Common	$0.37½ qr.	May 15	June 1
Calaveras Cement Co	Preferred	$1.75 qr.	Mar. 31	Apr. 15	Mineral Products	Class B	$0.17½ qr.	Apr. 30	May 1
Canada Cement Co	Preferred	$1.62½ qr.	May 30	June 20	Pennsylvania Salt	Common	$0.75 qr.	Mar. 31	Apr. 15
Canada Paving & Supply	Preferred	$1.75 qr.	May 15	June 1	Raymond Concrete Pile	Preferred	$0.75 qr.	Apr. 20	May 1
Cleveland Quarries	Common	$0.75 qr.	May 15	June 1	Raymond Concrete Pile	Common	$0.50 qr.	Apr. 20	May 1
Consolidated Rock Products	Preferred	$0.44 qr.	May 15	June 1	Standard Paving & Materials	Preferred	$0.50 qr.	Apr. 23	May 1
Fitzsimons & Connell	Common	$0.50 qr.	May 21	June 1	Standard Paving & Materials	Common	$1.75 qr.	Apr. 30	May 15
General Asphalt	Common	$0.75 qr.	June 1	June 15	Superior Portland Cement	Class A	$0.27½ M	May 23	June 1
Great Lakes Dredge & Dock	Common	$0.25 qr.	May 5	May 15	Texas Gulf Sulphur	Common	$0.75 qr.	June 1	June 15
Kentucky Consolidated Stone	Preferred	$1.75 qr.	Apr. 15	May 1	United States Gypsum	Preferred	$1.75 qr.	June 15	June 30
Lawrence Portland Cement	Common	$1.00 qr.	June 15	June 30	United States Gypsum	Common	$0.40 qr.	June 15	June 30
Lehigh Portland Cement	Preferred	$1.75 qr.	June 13	July 1	Wallace Sandstone	Preferred	$1.50 S.A.	Mar. 30	Apr. 15
Lehigh Portland Cement	Common	$0.25 qr.	Apr. 14	May 1	Worcester Salt	Preferred	$1.50 qr.	May 8	May 15
Lock Joint Pipe	Common	$0.67 M	June 30	June 30					

Review of Foreign Practice

Effect of Crushed Stone in Concrete and Mortar

In a recent series of tests at the construction laboratory of the Hochtechnische Bauingenieurschule at Moscow, the authors of this article investigated the results of adding to ordinary gravel concrete, as there available, certain proportions of limestone aggregate and of crushed sand-lime brick, which may possibly find some use in the U. S. S. R. as aggregate. The sand and gravel used in the tests were from the Moscow River, the gravel consisting only of very hard igneous stones of at least 1,000 kg/cm^2 compressive strength. The stone used was of such properties that it yielded a standard test cube of a compression strength of 160 kg/cm^2. From the results of the tests, presented in chart and tabular form, the authors make these observations:

(1) That the strength of the concrete varies with the strength of the coarse aggregate, in which the injurious effect of less strong aggregate on the strength of the concrete is particularly apparent in "fat" concrete.

(2) That the strength of the mortars corresponding to the concretes of highest strengths (with the igneous gravel) is less for all mixes used than for the corresponding concretes, the strength of the mortar in comparison with that of the corresponding concrete being the less, the fatter the concrete is.

(3) That the strength of the mortar corresponding to the concrete with aggregate of low strength is greater than that of the concrete in rich mixes (1:2:4) and less than that of the concrete in a leaner mix (1:4:8). With aggregate of lower strength the strength of the mortar is less than that of the concrete also in concrete of moderate richness (1:3:6).

(4) In lean mixes the strength figures of the mortar and of the concrete lie very close together. — Prof. P. Filossofow and Doz. A. Schtepetow in *Zement* 20:152-5, Feb. 12, 1931.

Portland-Cement Plants in France Now Total 78

The cement industry in France has been responsive to the demand for different kinds of cement in construction, and the availability of raw materials of different properties, and includes, therefore, plants manufacturing materials of several distinct classes. The first of these are the natural cements (including the *ciments prompts* and the Roman cements, which are natural cements of higher strengths than the usual natural cement). These cements are naturally manufactured where the natural stones for their production are available, which is principally in the departments of Yonne (the Vassy district), Cote d'Or, Ain, Savoy, Isere, Drome, Bouches-du-Rhone, Hautes-Alpes, Alpes-Maritimes, Lot and Lot-et-Garonne. In all France, a total of 73 plants produce materials in this classification.

Portland-cement plants in France number 78, and of the French colonies, there are four Portland-cement plants in Algeria, one in Morocco and one in Indo-China. A third distinct class is composed of the *ciment fondu*, or fused alumina cement manufactured by the well-known Société Anonyme des Chaux et Ciments Lafarge et du Teil at its plants at Teil (Ardeche), Baux-Roux (Alpes-Maritimes), Frignicourt (Marne) and Moutiers (Savoy.) In the fourth class are "supercements" yielding strengths higher than that of Portland and at earlier periods. The first product of this kind was manufactured in 1915 and later by the Société des Ciments Francais at Devres, and the Etablissements Poliet et Chausson make a super-Portland cement under a special brand name. Slag cements also have found wide use in France, and plants furnishing this product are naturally located in the departments where the metallurgical industry of France is centered: Moselle (four plants), Meurthe-et-Moselle (five), Marne (four), two each in Nord and Cher, and one each in Meuse, Seine-et-Marne, Seine, Seine-Inferieure, Cote-d'Or, Saone-et-Loire, Savoy, Isere, Charente-Inferieure, Basses-Pyrenees and Ariege. The sixth and final classification is the *grappier* cement, which, because of its nature, is closely associated with the districts and plants producing hydraulic lime. It is produced by 42 plants situated in the departments of Cher, Aube, Cote-d'Or, Dordogne, Tarn and Tarn-et-Garonne.—Paul Razous in *Le Ciment* 36:13-18 and 59-61, Jan. and Feb., 1931.

Further Information on the Alite Controversy

Since Guttmann and Gille's last researches on the composition of alite, which, on the basis of chemical, optical and X-ray investigations, was described as almost pure tricalcium silicate (*Zement* 1929, No. 30), there has been a lively controversy on the subject, particularly between E. Janecke and R. Brill. In this "final word," reviewing the bases of the controversy and also some later experimental material, Guttmann and Gille repeat emphatically that the existence of the compound $3CaO.SiO_2$ can no longer be doubted; that alite, the principal constituent of Portland cements with high lime contents, is neither a bicalcium-silicate enriched with lime (Dyckerhoff); nor a mixed crystal of aluminate rich in lime, or Janeckeit, and tricalcium silicate (Kuhl); nor a mixed crystal of predominant tricalcium silicate with tricalcium aluminate (earlier reports of Guttmann and Gille); nor a mixed crystal of Janeckeit and bicalcium silicate (Janecke); nor is bicalcium silicate the bearer of the alite (Nacken); but alite is tricalcium silicate, and a part of the alumina is combined in the celite (essentially $4CaO.Al_2O_3.[Fe, Mn]_2O_3$), the excess being found in the clinker as free aluminate.

At the end of this discussion is given a brief summary of the history of the "alite question" since Le Chatelier in 1884 asserted, on the basis of analyses of the *grappiers*, that tricalcium silicate is the principal source of the hydraulic hardening of Portland cement. Needed researches for the future are those that will discover the atomic arrangement of alite, and the process of its hardening.—Prof. Dr. A. Guttmann and Dr. F. Gille in *Zement* 20:144-147, Feb. 12, 1931 (communication of the Research Institute of the Union of German Iron-Portland Cement Works, Dusseldorf).

Makes Study of Cooler, Drier and Kiln Drives

The author of this article makes a detailed review of the various means of driving the rotary kilns, coolers, and driers used in the cement industry, all of which are cylindrical in shape and are rotated slowly on their axes, the slow rotation presenting a special and difficult problem of drive. His conclusions are all for the superiority of the motor and positive-speed reduction gearing, the advantages of which he sums up as: a saving, often considerable, in motive power; almost no costs for maintenance or attendance; lubrication costs reduced to a fraction of those with older types of drives; possibility of varying the speed within wide limits in the motor itself; ease of protection of motor and gears, and elimination of accidents to workmen.—Edgar Carlsson in *Revue des Materiaux de Construction*, Nos. 255 (pp. 495-9), 256 (29-33) and 257 (73-8), Dec., 1930, Jan. and Feb., 1931.

Foote Bros. Consolidates Offices at Chicago, Ill.

Foote Bros. Gear & Machine Co. announce the removal of its general offices from 111 N. Canal St., to 215 N. Curtis St., Chicago, Ill.

The purpose of the move was to permit consolidation and better coördination of the general offices and the manufacturing department in the interests of better service to customers and economy of operation.

Recent Patents

AMERICAN

Cement and Concrete

Concrete plant. Robert W. Frieroh, Chicago, Ill. No. 1,802,340.

Hydraulic cement concrete and mortar. Charles A. Newhall, Seattle, Wash. No. 1,802,667.

Cement composition. Pierre Zucco, San Francisco, Cal. No. 1,803,582.

Method of grinding Portland-cement clinker. Gustav A. Witte, Riverside, Cal., assignor to International Precipitation Co., Los Angeles, Cal. No. 1,803,821.

Crushing and Grinding

Hammer crusher. William A. Battey, Haverford, Pa., assignor to Pennsylvania Crusher Co., New York, N. Y. No. 1,803,585.

Excavating Machinery

Traction mechanism for excavators. George T. Ronk, Fairfield, Ia., assignor to Speeder Machinery Co., Cedar Rapids, Ia. No. 1,802,576.

Dipper-stick and boom structure. Harry E. Scott, Cleveland Heights, O., assignor to Thew Shovel Co., Lorain, O. No. 1,803,075.

Excavator-bucket. George T. Ronk, Cedar Rapids, Ia., assignor to Speeder Machinery Co., same place. No. 1,803,654.

Trip device for power shovels. Arthur E. Rutledge and Edward T. Cleary, Rockford, Ill. No. 1,803,678.

Tower excavator. George B. Massey, Chicago, Ill. No. 1,804,175.

Lime

Kiln for manufacturing lime or the like. Geoffrey Martin, Wembley, England. No. 1,804,362.

Unclassified

Mine-car. Leopold Almquist, Jersey City, N. J., assignor to American Car & Foundry Co., New York, N. Y. No. 1,803,376.

Mine-car. Warren V. Johnson, Bloomsburg, Pa., assignor to American Car & Foundry Co., New York, N. Y. No. 1,803,392.

Mining-machine. James E. Dillon, Masontown, Pa., No. 1,803,547.

Sand-slinging apparatus. Walter H. Wangelin, St. Louis, Mo. No. 1,803,575.

Screening apparatus. Morley P. Reynolds, Cleveland Heights, O., assignor to W. S. Tyler Co., Cleveland, O. No. 1,804,115.

FOREIGN

Blasting

Detonator. The Canadian Industries, Ltd., Montreal, Que., assignee of George Alfred Ashcroft, Polmont, Scotland. Canadian 311,052.

Cement and Concrete

Process for production of light, insulating concrete by use of effervescing materials. Kasp. Winkler & Co., G. m. C. H., Durmersheim, Baden, Germany. German 524,796.

Cementitious material. The National Building Materials, Ltd., assignee of Gerald Otley Case, London, England. Canadian 311,111.

Crushing and Grinding

Roll crusher for reducing materials of all sorts. Paul R. v. Knuppfer, Berlin-Friedenau, Germany. German 524,601.

Device for regulating the thickness of the charge in ring mills. Gebr. Pfeiffer, Barbarossawerke Akt.-Ges., Kaiserslautern, Germany. German 524,629.

Drilling

Drill. William R. Rioux, Toronto, Ont. Canadian 311,013.

Well-drilling apparatus. The Sullivan Machinery Co., Chicago, assignee of Harry C. Johansen, Michigan City, Ind. Canadian 311,341.

Drying

Shaft drier for granular materials. J. A. Topf & Sohne, Erfurt, Germany. German 524,867.

Drying, heating and cooling shaft. Frederic Joseph Warden-Stevens, London, England. German 524,688.

Apparatus for producing a hot mixture of air and gas, particularly for drying purposes. Heinrich Wilhelm Ullrich, Beierfeld, Saxony, Germany. German 524,777.

Drying kiln. The General Dry Kiln Co., assignee of Moritz A. Mueller, Seattle, Wash. Canadian 311,088.

Excavating

Excavator. Karl Theodor Jasper, Essen, Germany. German 524,634.

Clay excavator. Gaston Rigaux, Jumet, Belgium. German 524,610.

Bucket or grapple. The Hayward Co., New York, assignee of Herbert S. Atkinson, East Orange, N. J. Canadian 311,293.

Bucket. The Hayward Co., New York, assignee of Herman J. Brendlin, New York. Canadian 311,294.

Mixing

Mixer. Jacob Pouls, Berlin. German 524,602.

Mixing machine. The Hobart Manufacturing Co., assignee of Herbert L. Johnston, Troy, Ohio. Canadian 311,295.

PIT AND QUARRY *will furnish, at its actual cost, a copy of any patent cited here. A charge of ten cents per copy is made by the U. S. Patent Office, Washington, D. C., and readers may procure a copy directly by addressing the Commissioner of Patents, with payment for copies requested. Postage stamps are not accepted by the Patent Office. We will endeavor to obtain copies of foreign patents for our readers but we cannot give assurance in every case for the reason that copies of such patents are not printed for distribution as liberally as are the American copies, nor is there a fixed charge per copy.*

Materials Handling

Trough conveyor. James Malcolm Whitehouse, Annesley, England. German 524,775.

Distributing device for pulverulent materials. George Roscoe Alden, Westminster, and Charles Skentlebery, London, England. Canadian 310,952.

Container and distributor for pulverulent substance. Jean-Baptiste Salarnier, Crepieux-la-Pape, Rhone, France. Canadian 311,017.

Pneumatic conveyor. Tritos H. Thurmond, Shreveport, La. Canadian 311,236.

Conveyor. The American Manganese Steel Co., Chicago Heights, Ill., assignee of Corey Catlin Brayton, Oakland, Calif. Canadian 311,245.

Unclassified

Process for production of artificial slate. Franz Rosler, Dresden, Germany. German 524,774.

Roof support for mines. Frank Cookson, Newcastle-on-Tyne, England. Canadian 310,976.

Process of concentrating ores and minerals by flotation. The Canadian Industries, Ltd., Montreal, Que., assignee of William A. Douglass, Pennsgrove, N. J. Canadian 311,053 and 311,054.

New Corporations

UNION SAND & GRAVEL CO., Delaware Corp., Janesville, Wis. O. G. Olsen, 425 Hayes Bldg., Janesville, Wis.

HUDSON COUNTY CRUSHED STONE CO., North Bergen, N. J. 100 sh. com. Rexbaine Altschuler, Hackensack, N. J.

HELDERBERG CRUSHED STONE CORP., New Scotland, N. Y. $5,000. S. J. Daring, Albany, N. Y.

JOHN KLEIST SAND & GRAVEL CO., Green Bay Rd., Milwaukee, Wis. $25,000. John F., George E., and Walter Kleist.

HUTCHINSON SAND & GRAVEL CO., Dalton, Mass. $60,000. Raymond G. Hutchinson, pres.; Ruth M. Hutchinson, v.-pres.; Lucy M. Hutchinson, tr., all of Pittsfield, Mass. To produce sand, gravel and cement.

MORSE BROS. SAND & GRAVEL CO., Rochester, Minn. $100,000. Charles Seth, Elsie and Clara Morse, all of Rochester, Minn. To produce and sell sand, gravel and cement products.

PAWLING-PAWLING SAND & GRAVEL CORP., 37 Wall St., New York, N. Y. 100 sh. com. H. Greenwald.

SHEBOYGAN SAND & GRAVEL CO., 2017 S. 14th St., Sheboygan, Wis. $25,000. Geo. E. and Elsa Reimer and Herman Fritsch.

IGNEOUS SAND & GRAVEL CO., 1013 Dime Bank Bldg., Detroit, Mich. $25,000. Andrew H. Green, Jr., Grosse Pte., Village; Lloyd Wilson Howard Cary, Detroit.

CULVER CITY SAND CO., LTD., Culver City, Cal. $25,000. H. L. Rossiter, I. M. Rossiter and G. R. Willis, all of Los Angeles.

Manufacturers' Publications

Each publication listed below contains information of interest to nonmetallic mineral producers. Readers may obtain, without charge—except where a price may be stated—and without obligation, copies of any of these publications by writing directly to the manufacturers who publish them. Please mention PIT AND QUARRY *when writing.*

Air Compressors

WG-6 Belt-Driven Single-Stage Compressors. 16 p., 40 ill. (Bulletin 83X. Sullivan Machinery Co., Chicago, Ill.) Describes and illustrates a single-stage air compressor (belt-drive) available in a range of capacities from 68 to 1,619 cu. ft. and for any pressure from 10 to 125 lb.

Blasting

The Use of Parallel Connections for Electric Blasting in Tunnels and Drifts. 2 p., 2 ill. (E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.) A "how-to-do-it" description with explanatory drawings certain to be of interest to any quarry superintendent or plant operator.

Coal Pulverizers

BloMatic. 4 p., 5 ill. (The Her-Born Engineering & Manufacturing Co., Sandusky, O.) Describes and illustrates a unit-type pulverizer and blower for powdering coal and feeding it to the boilers. Illustrations show the construction of the unit and installation views in several types of industrial plants.

Drilling

Sullivan Drifter Rock Drills. 8 p., 8 ill. (Bulletin 88-F. Sullivan Machinery Co., Chicago, Ill.) Describes and illustrates a series of three drifter rock drills with 3-in., 3½-in. and 4-in. cylinders for all-around drill service.

Longyear Diamond Core Drills and Supplies. 102 p. Illustrated. (Catalogue No. 8. E. J. Longyear Co., Minneapolis, Minn.) A new catalogue bound in board covers which describes and illustrates a complete line of diamond core drills and drilling accessories. Contains instructive chapters on "Drilling," "Sampling," "Core Recovery," "Collecting the Sludge," "Analyses," and "Surveying Drill Holes."

Electrical Equipment

CR9504 Thrustors. 12 p., 17 ill. (General Electric Co., Schenectady, N. Y.) Describes and illustrates a device for producing a straight-line, constant-pressure thrust to supply pressure and actuate lever mechanisms, thereby replacing muscular effort on heavy machinery.

Excavators

Marion Type 450 Gas and Diesel Electric. 4 p., 3 ill. (The Marion Steam Shovel Co., Marion, O.) Describes and illustrates a new 1¼-cu. yd. excavator available with either gasoline-electric or Diesel-electric power. Engines operate at 1,000 r.p.m. and are direct-connected to a generator which supplies current to the hoist, crowd, and rotating motors.

Meters

Power Type Pressure Devices. 4 p., 6 ill. (Bulletin 70. Bailey Meter Co., Cleveland, O.) Describes and illustrates power-type pressure devices, explaining how the dead-weight-tester principle is combined with a hydraulic torque amplifier and a Selsyn motor system of long distance transmission.

Motors, Induction

Squirrel-Cage Induction Motors—Type KG. 4 p., 10 ill. (General Electric Co., Schenectady, N. Y.) Describes and illustrates a squirrel-cage induction motor of high starting torque and low starting current made in ratings of from 3 to 75 horsepower and for voltages of 220, 440 or 550.

Nuts

The Wheels of Industry Are Now Secure. 12 p., 5 ill. (General Automatic Lock Nut Corp., New York, N. Y.) Describes and illustrates an automatic lock nut which fits any standard thread, employs no washers or cotter pins and may be removed at will.

Rope

Wire and Manila Rope. 100 p. Illustrated. (Catalogue No. 30. New York Cordage Co., New York, N. Y.) A pocket-size catalogue and manual covering wire and manila rope. Contains several pages of information on the care and application of rope in the transmission of power.

Safety Devices

A Crane Without a Youngstown Is as Risky as a Boiler Without a Safety Valve. 4 p., 6 ill. (The Electric Controller & Manufacturing Co., Cleveland, O.) Describes and illustrates a safety limit stop for use with cranes.

Hoisting-Engine Concern Sold to New York Firm

On May 1 the manufacturing business of the Lambert Hoisting Engine Co. of Newark, N. J., was acquired by the McKiernan-Terry Corp. of New York, including all essential materials for the continued production of the Lambert line. To preserve the identity of the name, it will hereafter be known as the Lambert Hoisting Engine Division of the McKiernan-Terry Corp., in charge of and under the personal supervision of John A. Lambert. The sales activities will be transferred to the general sales office of the McKiernan-Terry Corp., 15 Park Row, New York.

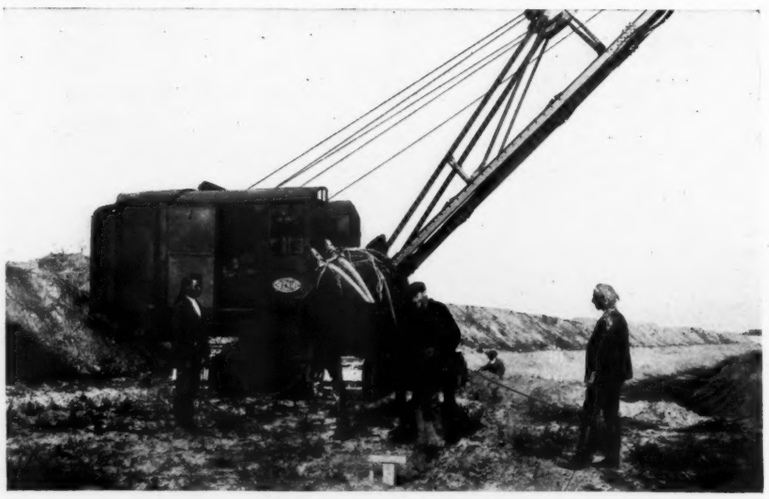
Lambert hoisting engines, derricks, cableways, handling machinery and similar products will hereafter be manufactured in the works of the McKiernan-Terry Corp. at Harrison, N. J., where during the past year extensive additions have been made to the plant, including the installation of new machinery, affording ample facilities for manufacturing the Lambert products.

Camels and Drag-line on Canal Project in Turkey

Modern machinery and that ancient beast of burden—the camel—both contributed in handling materials in constructing an irrigation canal in Turkey. The accompanying photograph shows one of the animals and a Model 600 P&H Diesel drag-line at the site of the project near the town of Nazilli.

The drag-line, equipped with a 1-cu. yd. scraper, moved approximately 1,000 cu. yd. of material per 8-hour shift. It was powered by an Atlas Imperial Diesel engine.

The camels were employed to transport cement, aggregates and equipment to the site of the operations.



Drag-line and camel helped to construct this irrigation canal in Turkey.

Insurance Problems Discussed

Cutting Costs on Fire Insurance at the Plant

REDUCING expenses, a popular theme at all times, is especially vital to producers today. In boom years industry can carry along some inefficiency in management, but when every dollar is important the insurance plans of your firm deserve a thorough study to see that they fit present conditions. Fire insurance is a logical starting point for this study because it is a big item which no one would dare to do without.

Cutting cost should never be confused with merely cheapening the quality. If you go into a haberdasher's to buy a two-dollar necktie and suddenly decide to save money by taking a one-dollar tie instead, you have an extra dollar in your pocket but you probably do not have as good a necktie.

Reducing Amount

This situation is more marked with insurance than it is with merchandise. Two obvious ways to reduce your insurance premium are to reduce the amount of insurance or to buy from a cut-rate company. When you reduce the amount of insurance below the full burnable value of your plant you save money if you do not have a fire, but you lose money if you do have one. In other words, you really are not saving money at all, but are simply gambling, which is the antithesis of insurance. Especially ill-advised is it to trim down the insurance if your policies contain a co-insurance clause. We recently heard of the owner of a $50,000 plant who, for economy, cut his insurance down to $25,000. But since his policies contain the "eighty-per cent. co-insurance clause," under which he has agreed to carry insurance of at least $40,000 (80 per cent. of the value) he has merely put himself in a position where he will collect only 25,000/40,000 of any loss, big or little. These remarks, of course, are not opposed to reducing insurance in proportion to any actual change in the inventory or in the appraised value of equipment.

Cheapening Quality

Insurance costs are sometimes cut not by reducing the quantity, but by cheapening the quality of protection. Without questioning the position of the well-managed companies in any branch of the insurance field, it must be clear that many cut-rate companies maintain their savings in premium at the expense of financial solidness. When you buy insurance in the best companies you have for all practical purposes full protection, regardless of conflagration, earthquakes or financial panics. If you buy inferior insurance at a lower rate you are not getting any bargain because you are taking on the catastrophe part of the risk yourself.

One factor which must be pleasant for property owners to think about is that most fire insurance is written for less than cost today. During the prosperous years of 1920 to 1929, a great many new insurance companies were organized. Most of this new capital was inspired not by the underwriting possibilities, but by the chance for financial operations with the assets. Today there are no profits from the investment angle of the business, and we clearly have more fire insurance companies than the country needs. There is consequently a terrific competition for business. Rates have been substantially cut almost everywhere and it is actually possible to get good insurance for less than its normal value.

Making Improvements

Although some property owners will find their craving for economy fully satisfied by switching from one company to another, the only saving that you can count as permanent is the rate reduction that is allowed for making improvements in the fire hazards of your plant. For fire-insurance rates are not made haphazardly nor by individual bargaining. Two different systems for rating are used, the Analytic System in the middle west and the Universal Mercantile Schedule in the east and far west. Although these schedules look quite different and include a good deal of detailed figuring they are basically similar and any property owner can read either schedule without technical training. Throughout the United States every commercial building is inspected and an individual survey is written describing it. Thus you will find on file in the inspection bureau for your state an outline of how the rate on your plant is arrived at. Your rate is the sum total of charges for the various details of fire hazard. The analysis covers four classifications: hazards due to the manner of construction of your building; hazards due to the nature of the occupancy; credits for private fire protection; and charges for "exposure," or the chance of fire starting in an adjoining building and spreading to yours. These four classifications will be commented on in the following paragraphs.

Safe Chimneys

When you think of the construction of your building you are inclined to regard it as something that is definitely fixed for all time and if the underwriters do not approve of it, that is just your hard luck. To the extent that this feeling is justified, you should make sure that whenever you build a new building or remodel or lease an old one, you must first make a study of what sort of insurance rate you are going to get. But even if you cannot change the walls, floors, elevators, or area of your present building, you may find some worth-while improvement. One of the most common and dangerous defects is unsafe chimney or flue conditions, which can usually be remedied. A standard chimney is one built of solid brick from the ground up. Chimneys built of tile or of brick set on edge instead of on the side, or metal flues running through partitions, floors or roofs are substandard, and the appropriate penalty is added to your fire insurance rate for any such conditions that may be found on your premises.

The greatest fire hazard comes from the occupancy. Buildings do not catch fire by themselves. They are almost invariably set on fire by the ignorance or negligence of some man. Fortunately the fire hazard in the nonmetallic mineral industries is comparatively slight, because they do not possess the inherent risks of mattress factories, paint shops or other hazardous industries. The following are some of the commonest items which should be checked over with your state rating bureau to see whether you are paying a price for carelessness: lack of safety cans for oily waste and gasoline, lack of "No Smoking" signs in the plant. Many fire-insurance rates are unnecessarily burdened by such charges which can be easily removed by paying a little attention to them.

Fire Protection

Exposure to fire in adjoining buildings is hard to control except through locating your plant away from other property and possibly by using wired glass windows. But the various forms of private fire protection should have the attention of every executive. The chief forms of such protection are: chemical extinguishers, water pails, night watchmen, standpipes or yard hydrants, fire escapes (on buildings of more than two stories), and automatic sprinklers (in large buildings). These are all practical from the standpoint of fire prevention and they lead to definite reductions in your insurance cost. For detailed advice on this subject it is best to go to your insurance agent or to your state rating and inspection bureau.

Eastern Representative Named by Tank Builder

The Graver Tank & Mfg. Corp., of East Chicago, Ind., manufacturers of water-treating equipment, tanks, and special plate construction, has appointed W. B. Connor Co., Chrysler Bldg., New York, as its eastern representative.

New Machinery and Supplies

Oval-Bag Dust Arrestor Filters Air and Gases

An oval bag dust arrestor has recently been introduced by the Parsons Engineering Corp., of Cleveland, O. It consists essentially of a series of oval-tube filtering units in a bag house, built over an inlet expansion chamber with hopper bottom. The dust-laden air upon entering the lower chamber expands, allowing the heavier particles to fall to the hopper below. This is shown in the accompanying drawing. The dusty air then passes upward directly into the oval tubes, filtering through the cloth and passing as clean air into the bag house from which it is drawn by an exhaust fan.

To remove the dust accumulated on the inside of the bag units, the fan must be shut off and the shaking mechanism operated for a short period at intervals, generally between shifts. The dust shaken from the inside area of the bags discharges through the open bottom into the hoppers below in which a considerable amount of the heavier particles of dust have already collected. Slide gate valves in the bottom of the hoppers are provided for periodical removal of the dust.

The bag house is built of standard 16-gauge galvanized-steel sheets, reinforced on the inside for rigidity with an angle-iron frame from which the bag units are also suspended.

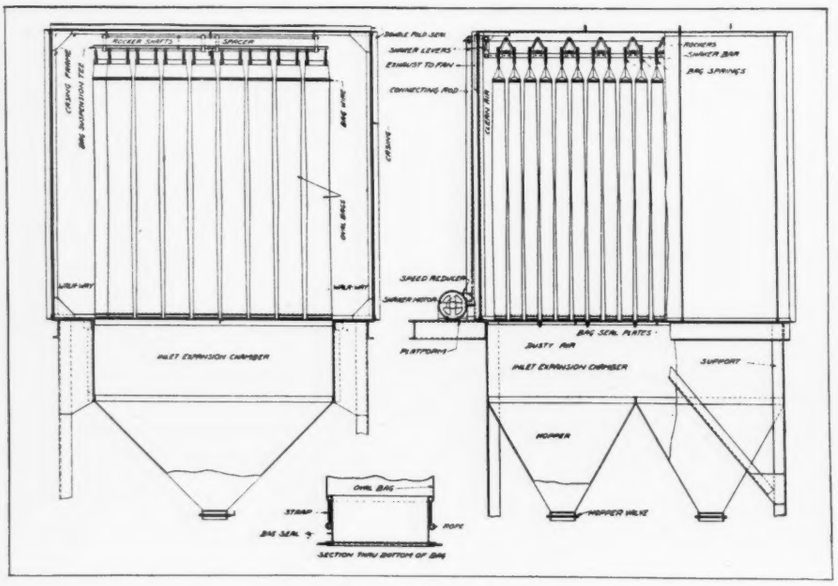
The bags are tented at the top and suspended with gromets from "T" bars by means of two coil springs, preventing rotation. The "T" bars in pairs are supported on either side of rocker castings, balancing the tension of the springs and bags. The rocker castings are supported and can pivot about a horizontal suspension rod, when oscillated about the suspension point by the reciprocating shaking rod. This shaking rod is moved by a crank arrangement attached to a gear reduction which is driven by a motor. The gear reduction and motor unit are mounted at the end of the arrestor either in a case at the top or on the entrance platform.

The bottom of each bag is slipped over an oval beaded collar and securely fastened by a web strap. A reinforcing cloth strip inside seals the bag in a unique manner to the oval collar preventing leakage and wear.

The oval bags in operation assume a round shape due to internal air pressure and the accumulated dust adheres to the inside wall of the bag forming a hollow cylinder. When the air is shut off and the bags stretched by shaking, the bag section again becomes oval, breaking down and dislodging the hollow cylinder of dust. In addition to this deforming of section, the lateral movement due to oscillation about pivot point of rocker casting completes the positive discharge of accumulated material.

Each individual bag can be installed or removed without unhooking any of the other bag units. The time required to remove or install a bag involves but a few minutes, as it requires merely unhooking at the top and loosening the strap at the bottom.

As the area in each bag unit is limited a leak requires only the replacement of a relatively small area of cloth. If a new bag is not at hand, unhooking bag unit at the top and rolling it down will seal against leakage temporarily, until new unit can be obtained.

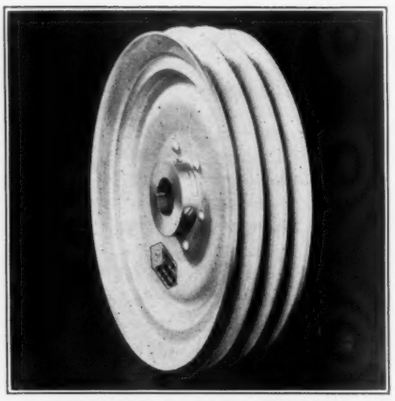


Cross-sections of the oval-bag arrestor.

The standard cloth used is a cotton fabric made to specifications adopted after extensive experiment and test, to give the least resistance to air flow and yet retain the finest particles of dust. The single longitudinal seam in the bag is doubly sewn and reinforced. The web straps and buckles are sewn to and are a part of the bag unit. In this type unit the cloth is not in contact with any framework of wire or wood. In fact, no wood is used in any part of the oval bag arrestor.

Lightweight Sheave for Multiple V-Belt Drives

A new type of pressed steel Texrope sheave to meet the demand for a lightweight, low-priced drive, has been developed by Allis-Chalmers Manufacturing Co., and, complete



Pulley sheave for multiple V-belt drive.

Texsteel Texrope drives are available from stock for immediate delivery.

Texsteel sheaves are die pressed from extremely tough steel and each section is then welded both at the web and at the rim to eliminate all vibration and noise and to give an accurate balance for true running. They are manufactured in a large range of diameters, permitting ratios as high as 6:1. Painted with aluminum paint as protection they afford a pleasing appearance.

Crankless Diesel Engine Explained to Engineers

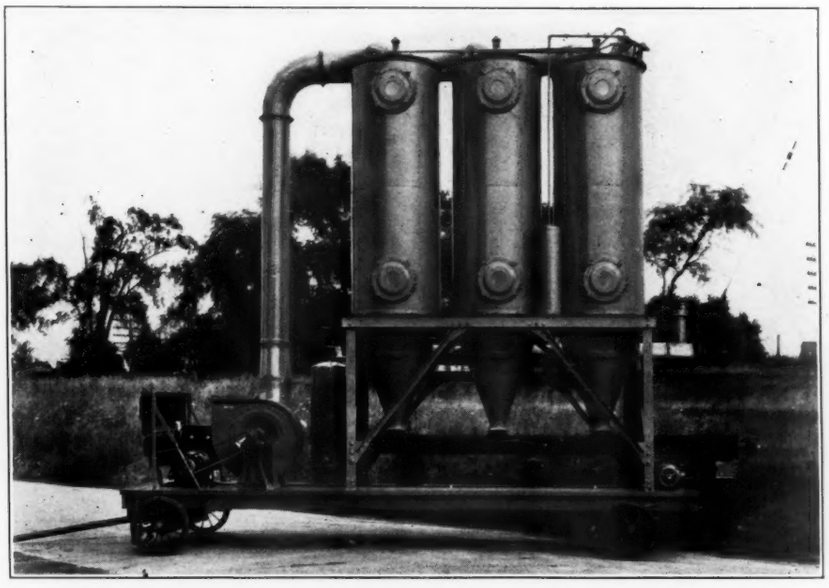
Principles and innovations in the Mitchell crankless engine for Diesel-electric power, were described to those attending an open meeting of the Schenectady section of the American Society of Mechanical Engineers recently. E. S. Hall, automotive engineer with the Mitchell-Crankless Co., New York, N. Y., declared that the same principle of film lubrication employed in pivoted-segment thrust bearings is used in the Mitchell-Crank-

less mechanism. This makes possible a compact multicylinder engine of high mechanical efficiency. Dynamic balance is perfect and operation is smooth.

For large engines compactness and lack of vibration simplify installation and permit lighter footings. For locomotive power, engines up to 4,000 hp. can be accommodated. By means of the engine, Mr. Hall prophesied that "railway locomotive Diesel engines can be built, certainly up to 4,000 h.p. without the necessity for increasing the strength of bridges or increasing the size of tunnels."

Portable Machine Tests Plant-Dust Conditions

The portable test dust-recovering machine shown in the accompanying illustration has recently been introduced by the Dust Recovery & Conveying Co. of Cleveland, O. This equipment powered by several electric motors, is mounted on wheels so that it can be operated at different places to determine the exact conditions required for building a permanent machine. The equipment is a standard Dracco 3-compartment filter, so the results for the use of this unit are not subject to the inaccuracies of a laboratory size test unit. The dust-laden gas or air is drawn through the intake manifold at the right, which has a vertical connection to admit atmospheric air for cooling if the intake temperature is above 180° F. The gas is drawn through the three filters by the exhaust fan and the solids are retained on the insides of the fabric tubes. The dust is precipitated regularly by the automatic cleaning mechanism and discharged by the lower right hand outlet through the screw conveyor. The portable unit is completely self-contained and requires only the bringing in of a source of electric energy.



The portable dust-recovery test equipment.

Compressed air is used for cleaning the filters. Electric motors are employed to operate the fan, conveyor, air compressor and also for the filter shaker. At the extreme left is the control panel with starters for all the units.

New 37-B convertible excavator.

Simple Convertibility Features New Excavator

The new 37-B, a 1¼ to 1½-cu. yd. shovel, drag-line, crane and clamshell, is recently announced by the Bucyrus-Erie Co., South Milwaukee, Wis. With a choice of Diesel, gasoline, or electric power; rope or chain crowd on the shovel; regular or special extra long and wide mountings for soft ground work on the drag-line, the 37-B fits well the various requirements of the field. Simple convertibility is a feature.

Unit steel construction, ball bearings on all continuously running shafts, over-size clutches, gears enclosed and running in oil, box girder boom, and single-shaft-drive crawler mounting all contribute to the extremely low maintenance costs for this machine and increase its years of serviceability.

A few other features of interest are: hoist clutches power set — all operating levers toggle in; smooth operating, oversize brakes with cooling fins; steered from operator's stand with cab in any position; double-operating chocking brakes on crawler mountings controlled from operator's seat; swing brake for operating on grades; three-side vision for operator; steel cab; inserted tooth dipper; only two bearings to a shaft; power dipper trip; self starter for engines; power boom hoist—self locking.

New Stationary Diesel Engines Are on Market

The Cooper-Bessemer Corp., Mt. Vernon, O., is distributing a folder which contains illustrations and specifications of the new stationary Type JT Diesel engine. Bore is 11½ in., stroke 15 in. Cylinders are 3, 4, 6 or 8 in number. Rated horsepowers are 150-180; 200-240; 300-360; 400-480 when operating within the speed range of 300-360 r.p.m. with cast-iron pistons.

Although fuel economy, trim lines, enclosure, accessibility, and option of built-in accessories are emphasized points—the most noticeable innovation is the placing of the spray valves and driving levers in a position directly below the cam shaft, easily reached from the engine platform. Removal of the engine head can thus be accomplished without disturbing the fuel injection system.

Copies of the folder may be secured by writing the corporation direct.

Greater Closing Power in New Hook-on Bucket

The Erie Steel Construction Co. announces a hook-on or single-line type of clam-shell bucket. With the addition of this new unit the company now manufactures a type and size bucket for every phase of digging and material handling.

The new hook-on bucket is improved in design which gives it from 10 to 25 per cent. more closing power, thus

making it valuable for more efficient digging on a wider range of work. This bucket is instantly available for work on cranes by placing the bucket yoke on the crane hook, therefore, it is only necessary to tie-up the crane for the length of the bucket job. Complete operation of the bucket is carried on from the crane cab. The action of the bucket is quick and positive, and it is safe because the latching mechanism cannot accidentally become disengaged, thereby discharging the load. The closing line is reeved around snubber sheaves, eliminating serious opening shock and, when the bucket is fully open, the power arm comes to rest against heavy bumper springs which act in combination with the rope reeving to give a smooth-opening bucket.

The scoops are amply reinforced. The high-carbon-steel lips extend to the top of the scoops and tie in with the hinges at this point. The back band extends entirely around the scoops and ties in with the hinges. All corner bars are drop forged from solid bars and are attached to the scoops by corner brackets which are securely riveted to the sides and backs of these scoops. These brackets extend over the tops of the scoops so as to relieve the down thrust on the rivets. Moving parts are bronze bushed and lubricated by the Alemite system. A grease gun is furnished with each bucket.

This bucket, like all other Erie buckets, is recommended for severe service. From the head to the scoops each part is carefully designed and constructed to withstand hard service.

The new hook-on bucket is guaranteed to do the work for which it is recommended and to be free from defects in material and workmanship for a period of one year.

The Erie Steel Construction Co., Erie, Pa., will be pleased to send circulars describing and illustrating the new bucket and to furnish prices to prospective customers.

The new hook-on clam-shell bucket.

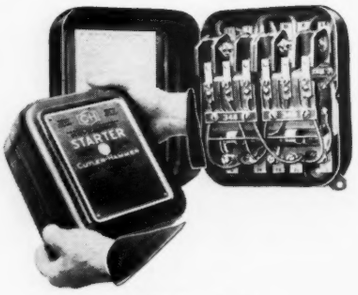
New Reversing Starter for Light-Duty Motors

The development of a new across-the-line type reversing starter for d.-c. and a.-c. polyphase motors up to three horsepower is announced by Cutler-Hammer, Inc., Milwaukee, Wis. The new starters are designed for use with motors on hoists, small machine tools and other equipment where a half-time, intermittent-duty reversing starter is required.

Reversing is accomplished by means of two mechanically-interlocked magnetic contactors which are controlled from a remote point by means of a separate push-button master station.

Small size and high operating efficiency are features of this new starter. Overall size is 7 1/16 in. wide by 8 7/16 in. high by 4 7/16 in. deep. The contactors are a new three-pole design. Silver to silver contacts reduce arching and pitting to a minimum and assure maximum current-carrying capacity at all times. The magnet structure consists of a laminated frame with a shading coil for alternating current and a brass shield for direct current.

These enclosed reversing starters are furnished in two types: Type SRA is arranged for two wire control only. It has a maximum capacity of 1 hp. Type SRB can be used for either two or three wire remote control. Blowouts are provided to give maximum capacity of 3 hp.



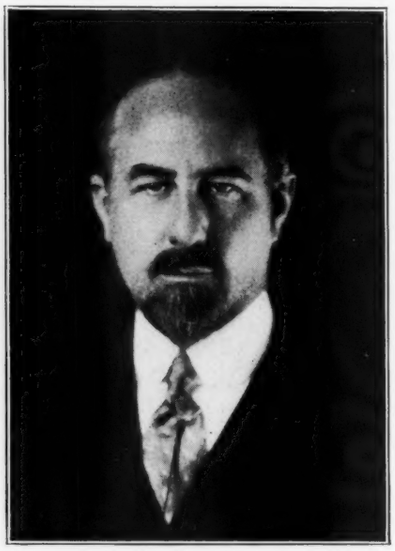
Across-the-line starter.

The Chain Belt Co. of Milwaukee, Wis., has moved its Buffalo, N. Y., office from 753 Ellicott Square to 1807 Elmwood Ave. T. E. Cocker is the district manager in charge of this office.

Dorr-Oliver Corporation Formed by Merger June 1

John Van Nostrand Dorr and Edwin Letts Oliver have announced a union of the businesses and assets of The Dorr Company and Oliver United Filters, Inc. This union was brought about on June 1st by the formation of a new company, to be known as Dorr-Oliver Corp., under the joint management of Messrs. Dorr and Oliver.

Dorr-Oliver Corp. will function through its two, wholly-owned operating units, a new Dorr Co., Inc., and a new Oliver United Filters, Inc. Mr. Dorr and Mr. Oliver will head their respective companies and with the aid of their present executive and technical staffs, will continue on behalf of Dorr-Oliver Corp. the businesses which they have individually initiated, organized and expanded so successfully in the past.



John V. N. Dorr.

The businesses of the two uniting companies are of long standing and complementary. The Dorr Co. occupies a leading position in the fields of agitation, classification and sedimentation through its equipment, built up around the original inventions of its founder, John V. N. Dorr; and the Oliver United Filters, Inc., occupies a similar position in the field of filtration through the inventions of Edwin L. Oliver and E. J. Sweetland.

Mining Laws of Canada Revised in New Edition

A revised edition of *The Mining Laws of Canada* has just been issued by the Canada Department of Mines, John McLeish, director.

The book gives a digest of all provincial and dominion laws or regulations affecting mining and quarrying, contains schedules of licenses and fees and contains a list of royalties levied and bounties paid for certain minerals.

Legal Information for Operators

Friends' Testimony Held Valid by Higher Court

In all cases testimony of witnesses will be accepted as true, unless a party in the suit introduces testimony contradicting the statements made by the witnesses. So held a higher Court in Thompson v. A. Morgan Co., 26 S. W. (2d) 807.

In this case it was disclosed that a hauling company contracted to haul gravel. According to witnesses one day the driver of one of the trucks was ordered by his employer to drive forward. The truck ran over a workman who was working at the side of the truck. The injured employee sued to recover damages. The employer attempted to avoid liability upon the plea that the testimony in favor of the injured employee was given by his friends and that such testimony was not correct. Notwithstanding this argument the Court held the employer liable.

Gravel Firm Must Prove Right to Extra Payment

Generally speaking, a contractor, or seller of material, who sues to recover payment for extra work or material, is bound to prove that he is entitled to a recovery, otherwise the Court will decide in favor of the owner or purchaser.

For illustration, in Peterson, Shirley & Gunther v. State, 232 N. W. 94, it was shown that a contractor accepted a contract to surface a highway with gravel. The contract called for an estimated 125,730 sq. yd. of gravel surfacing at 37½ cents per sq. yd. The plans called for gravel four inches deep. The road project was about ten miles long. When the approximately estimated quantity of gravel was spread it was found that there were nearly two miles of the project yet to be graveled. The contractor was paid for the contract quantity, but sued for extra gravel spread upon the last two miles. The contractor claimed he was ordered to spread the gravel thicker than the contracted four inches and so used the contracted volume on less mileage. The state claimed that the gravel was not up to the screen tests required by the contract and so it was necessary to require it to be spread thicker.

For the reason that the contractor failed to prove his contentions, the Court held that he was not entitled to recover for the extra gravel, saying:

"It is to be borne in mind that on this particular project the contract contemplated that the whole mileage of the project would be surfaced by the plaintiff (contractor) with the estimated and stated amount of gravel, and that, when the controversy arose, the state had paid in full under what it claimed was a mistake. . . . The plaintiff did the work and now sues, not on the contract, but on a *quantum* merit, for the reasonable value of its work. It takes the same measure of value per yard as was in the contract but alleges it as the reasonable value. It is elementary that the burden is on the plaintiff to prove its allegations. It must show that there was an express or implied agreement to pay for this so-called extra gravel. We find it has not sustained this burden by a preponderance of the evidence."

Courts Will Not Modify Material Freight Rates

It is well settled that the power to fix railway freight rates lies with the Legislature, whether exercised by the Legislature directly or by an administrative body under delegated authority. In other words, the fixing of rates is not a function of the Court, and the right to review the conclusion of the Legislature or an administrative body is limited to determining whether the board acted within the scope of its authority, or whether a constitutional right of the carrier has been infringed upon by fixing rates which are confiscatory or insufficient to pay the cost of the traffic and return to the carrier a reasonable profit on the investment.

For instance, in Indiana Harbor Belt R. Co. v. National Stone Co., 172 N. E. 708, a stone company filed suit contending that the established freight rates for transporting stone between two designated points were unreasonable. The stone company asked the Court to render a decision reversing an order issued by the Commerce Commission establishing these rates. However, the Court refused to do so, saying:

"The Public Utilities Act does not contemplate, and the law does not authorize, a Court to put itself in the place of the commission and try a question presented to the commission a second time, and thereafter substitute its own judgment for that of the commission. No Court should attempt to usurp legislative or administrative functions by setting aside a legislative or administrative order on its own conception of the wisdom of it. The orders and decisions of the commission are subject to review as to the reasonableness of the commission's conclusion, and an unreasonable order is unlawful. However, where there is substantial evidence to warrant it, an order of the commission should be sustained."

Therefore, it is quite apparent that in cases of this kind it is necessary that the party who complains of freight rates must prove that such rates are unreasonable and unlawful, otherwise he will not obtain a favorable verdict.

Secured Creditors Get First Claim on Assets

Generally speaking, in distribution of the assets of a bankrupt firm or corporation, all creditors are entitled to receive amounts proportionate to the money due from the bankrupt. On the other hand, it is important to know that where a corporation is being liquidated a creditor may sue and establish a lien on the assets superior to the claims of unsecured creditors. This is true although the corporation is insolvent. So held a higher court in Mikels v. Cowie Cut Stone Co., 171 N. E. 251.

The facts of this case are that a stone company was being liquidated and its assets were in the hands of a liquidator whose business was to wind up the affairs of the corporation. A creditor, who previously had obtained a judgment against the stone company, filed a lien to recover the amount of the judgment. In holding the creditor entitled to collect the amount of this judgment, the Court said:

"Even though the question of insolvency of the corporation had been an issue . . . there is nothing relating to liquidation that would have the effect of depriving creditors of their legal remedies. . . . That lien is of such a nature in our judgment that it entitles the creditor, acquiring it, to a preference over other unsecured creditors."

Right of Firm to Lien on Purchased Property

It is important to know that, as a general rule, a mechanic's lien attaches to whatever interest a purchaser of the property had when delivery of material began or the work was started.

For example, in Thomas v. Setliffe, 28 S. W. (2d) 344, the litigation involved a mechanic's lien filed against mortgaged property on which a recent purchaser had contracted for building improvements. In holding the lien valid, the Court said:

"The mechanic's lien attached to whatever interest Setliffe (purchaser) had in the property when the delivery of material began. . . . Mechanic's lien creditors have a right to rely on the record title of the owner of property and their liens have priority over the lien of a mortgage, where delivery of material begins before the registration of that mortgage."

Correspondence

Blaine S. Smith Replies to Aman Moore's Letter

To the Editor:

The argument in Mr. Aman Moore's letter [PIT AND QUARRY, May 20, p. 68] is based on a number of statements and implications with which I must disagree. These statements are substantially as follows:

1. That most of the increased output of Portland cement referred to in my article in the March 25 issue of PIT AND QUARRY is from new plants equipped with kilns measuring from 400 to 600 ft. long and with closed-circuit grinding equipment.

2. That such new plants can produce without additional cost cement that in 24 hr. will develop as much strength as "ordinary" Portland cement will in 30 days.

3. That the older plants are unable to compete with the newer plants on the basis of quality.

4. That the older plants have not kept up with the progress in the art.

In this country kilns in excess of 400 ft. in length are a development of the last year and, up to the present time, kilns of such great length have been a very minor factor in the increased production capacity. Mr. Moore's letter gives the impression that this extreme length is necessary to produce high-quality cement. As a matter of fact, the purpose of these kilns is an attempt to compete in cost with shorter kilns used in connection with waste-heat boilers. Some of the best high-early-strength cements are being produced in relatively short kilns.

While the building of new plants has been a considerable factor in the increased producing capacity of the country, a very large part of the increase has been due to the modernization of the older plants, in which every step towards greater efficiency and better quality has led to increased production.

Cement that will develop in 24 hr. a strength that "ordinary" Portland cement will develop in 28 days can not be produced, even in the most modern plants, at a cost that will enable it to compete in price with the so-called "ordinary" cement, and the uses in which such high-early-strength is sufficiently desirable to warrant a higher price require about one per cent. of the total volume produced.

Mr. Moore's implication that the older plants have not attempted to keep abreast with progress is unwarranted. Much of the significant advance in the art has been developed in the older plants. While it may be true that there are some laggards in the industry—you will find them in every industry and I hold no brief for them—the fact remains that the older plants, on the whole, have been kept in condition to compete both as to price and quality with any of the newer plants.

We have been faced, in the case of nearly every new plant that has been launched in recent years, with extravagant claims as to high early strength. Some have, for a time, produced cements giving substantially higher strengths at the early ages than their older competitors, but they have invariably found that the cost of this kind of production is too high to allow a continuation of the practice.

There seems to be an attempt to create the impression that the high-early-strength cements are inherently superior to what it pleases Mr. Moore to call "ordinary" cements. This is not proved and there are so many possibilities of unfavorable results that many engineers are objecting strenuously to any further increase in the early strength of standard Portland cement.

PENNSYLVANIA-DIXIE CEMENT CORP.
Blaine S. Smith, *Pres.*
New York, N. Y.

"Safe Hand Tools" Is Suggested Topic for June Safety Meeting

By W. DEAN KEEFER
National Safety Council

EVEN in this age of machinery, many operations are still performed largely, if not wholly by the use of hand tools. This is especially true in the cement and quarry industry. It follows, therefore, that a large percentage of accidents in this industry will be from hand tools which are used carelessly, used improperly, or used in poor condition.

In cement and quarry operations there will always be hazards in the use of hand tools in such operations as slipping, drilling, digging and loading. Likewise, there will always be hazards in the use of hand tools in the cement mill shop, and in construction, repair and maintenance operations.

There are many accidents from the use of tools in metal and wood pattern work, in the carpenter shop, in hand forging and blacksmithing, in telephone-line repair work, in railroad-track maintenance and extension, and in all mining operations. In the state of California, for a 10-year period, about 62,000 industrial accidents were reported and nearly 6,000 of these were due to defective tools and the handling of tools.

Ordinarily, the thought of danger is especially associated with power-driven machines. But, in most plants, careful investigation will show that a surprisingly large percentage of the accidental injuries in all outside operations and in the shop are from the use of hand tools.

Machine operations that may be hazardous are usually quite apparent, and the installation of practical guards usually will eliminate the hazards. With hand tools it is different. Hand tools have the appearance of being harmless, and the average worker usually does not observe the same safety precautions that he would observe with a machine. Most accidents from hand-tools are due to their misuse, to neglect to keep them in proper condition, and to leaving them in dangerous places.

In a thorough investigation of the possible hazards from hand tools, special consideration should be given to the material from which the tools are made, the methods which have been used in making and tempering the tools, the plant program in the inspection of the tools, the proper care of the tools, and their possible misuse.

The chairman of the meeting should discuss the subject of "Safe Hand Tools" with the foreman of the tool room well in advance of the meeting date. He should request that at least five or six samples of unsafe tools which have been collected should be held for exhibit at the meeting.

Arrangements should be made with several members of the Safety Committee, or with several foremen of different departments, to present short talks on typical accidents that might occur from the use of unsafe hand tools.

For instance, member number one, exhibiting a machinist hammer with a split handle, could explain that: (a) should the loose head fly off, a workman near him might be injured; (b) the use of a split handle would possibly injure his own fingers; (c) the defective tool is not as efficient as one in sound condition.

Member number two, exhibiting a tool with badly mushroomed head, could explain the danger of chips breaking off and striking his helper in the eye; or he could show the wrong way and the right way to use a wrench.

The tool-room foreman should then be asked to talk on the method of tool inspection and repairs by the boys in the tool crib, mentioning such details as:

Inspection made as tools are checked in.
Repairs made when necessary.
Tool discarded if repairs would be ineffective.

As a preliminary preparation for the meeting the chairman may get valuable information from a safe-practices pamphlet of the National Safety Council on "Hand Tools," which may be secured on request.

NEW TELSMITH WHEELING JAW CRUSHERS

FEATURES

Cylindrical Roller Bearings—Used in both swinging jaw and frame . . . proven more suitable for heavy crushing service than any other type. Equipped with special piston ring seals that keep lubricant in and dust out.

Easily Accessible — With cylindrical bearings, crusher is quickly dismantled and assembled in the field, even by inexperienced labor. Bearings require no adjustment.

Rigid Manganese Die Plates—Stationary and swinging jaw plates are manganese steel, accurately fitted, clamped tightly in place by wedge blocks.

Steel Frame—Main structure is annealed cast steel. Machined inside to provide permanently true surfaces for jaw dies, toggle and wedge blocks. Frame is bored (both sides at one setting), assuring true permanent alignment of shaft and anti-friction bearings.

Effective Crushing Stroke — Upper part of swinging jaw moves outward to crush coarse rock at top . . . then retreats . . . and lower part of jaw moves forward to finish crushing action at bottom. Three toggle settings provide for more efficient reduction at coarse or fine adjustment.

Easy, Rapid Adjustment—Can be made while crusher is running. Wide range of opening provided. Adjusting mechanism simplified and made more substantial.

V-Rope Drive—Drive pulley on all sizes can be furnished to provide for V-rope drive.

Made in 4 sizes:
9" x 16"—9" x 21"—9" x 30"—9" x 36"

TELSMITH sound engineering . . . coupled with Telsmith experience gained in twenty-five years of crusher specialization . . . have produced a machine which effects a greater reduction in one process—the *new Telsmith Wheeling Jaw Crusher.*

Important improvements incorporated by Telsmith engineers into the Wheeling jaw crusher . . . including advantageous changes in the bearings, adjusting mechanism, jaw clamping device and main structure . . . make the new Telsmith-Wheeling a typically Telsmith machine—stronger, more efficient and most reliable.

WRITE FOR NEW BOOK SENT FREE

SMITH ENGINEERING WORKS

504 EAST CAPITOL DRIVE — **MILWAUKEE, WIS.**

Canadian Representatives: Canadian Ingersoll-Rand Co. Ltd., Montreal, P. Q.

11 West 42nd St., New York City — 716 Builders Bldg., Chicago, Illinois — Harrison Bldg., Philadelphia, Pa. — 1109 Statler Bldg., Boston, Mass. — California Equip. Co. Los Angeles, Calif.

TELSMITH